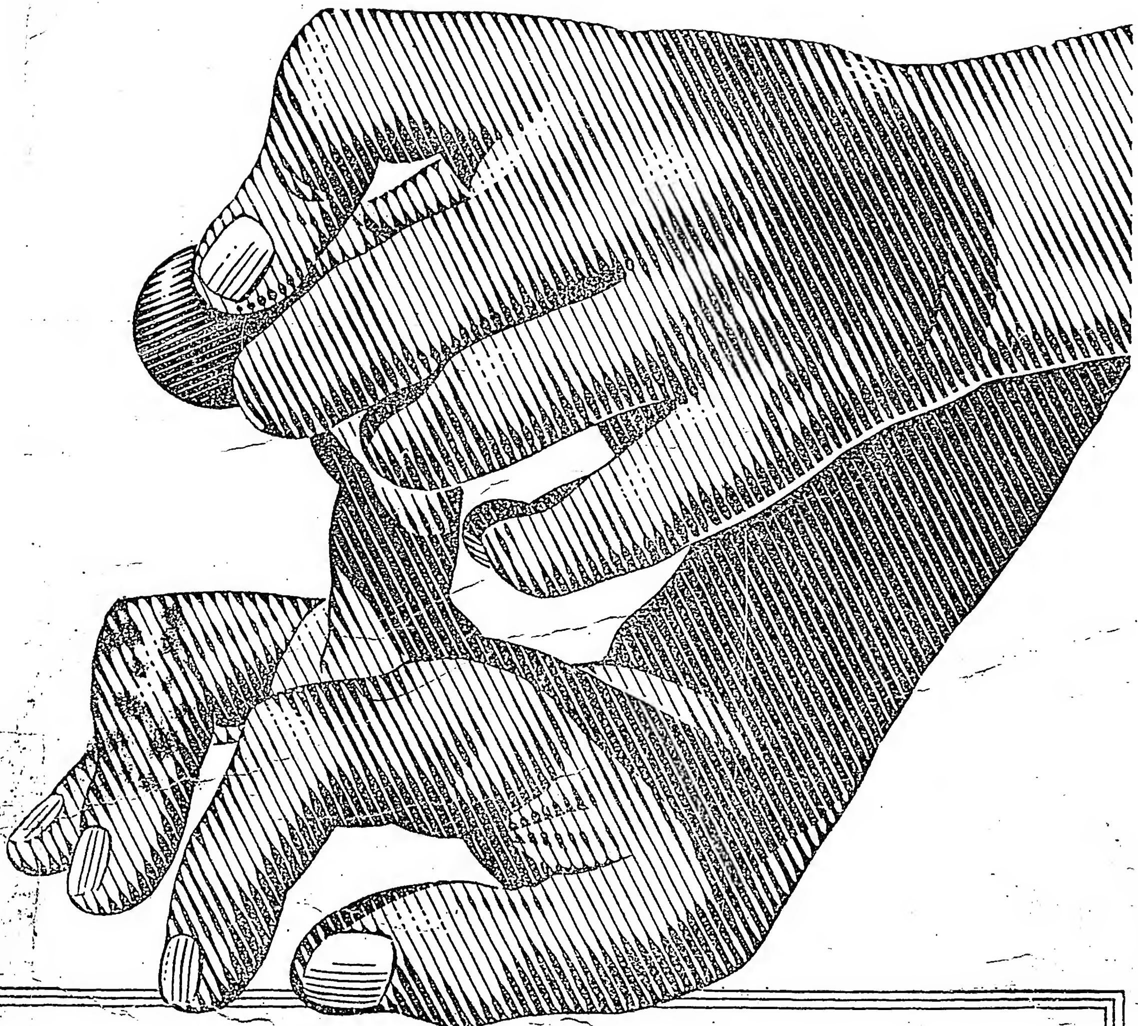
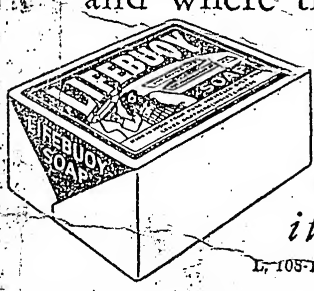


Playful hands get dirty . . .

and where there's dirt there's *Danger* from germs!



Wash often with

LIFEBUOY SOAP

it protects you from the germs in dirt!

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SOME PRACTICAL HINTS ON HOW TO GROW MORE PADDY

By J. J. CHANDNANI, Division of Agronomy, I.A.R.I., New Delhi.

TO improve the economic position of the country, it is necessary that the land should produce more than what it is producing now. It has been seen that the yields of various crops where results of modern science are applied in practice are at least more than double than what the average framer gets in this country. The recent results of crop competition have shown that Indian soils are capable of giving higher production if these are properly tapped.

How the potentialities of the soil can be tapped by every farmer will be discussed in a series of articles.

I hope by now you must be familiar with my articles entitled "Things to do on the farm during the month". Please keep afresh with what has been told to you during the last year.

I am now giving below some practical hints on "how to grow more of paddy".

Preparatory tillage : Wherever possible and feasible paddy fields be ploughed up during the resting period. The practice of hot weather cultivation helps you to check the growth of weeds and cut down the cost of puddling. If this has not been done, it may be done wherever possible and feasible. The value of hot-weather cultivation needs no emphasis. If you are not doing it, do it on a small area and watch results for yourself.

The bunds of paddy should be well strengthed to to increase area under transplanting and reduce area under broadcast.

Optimum time of sowing : Sowing at optimum time gives you greater returns in yield. Keep yourself in readiness for sowing your crop in time. The optimum period varies from place to place, but approximately is as under:

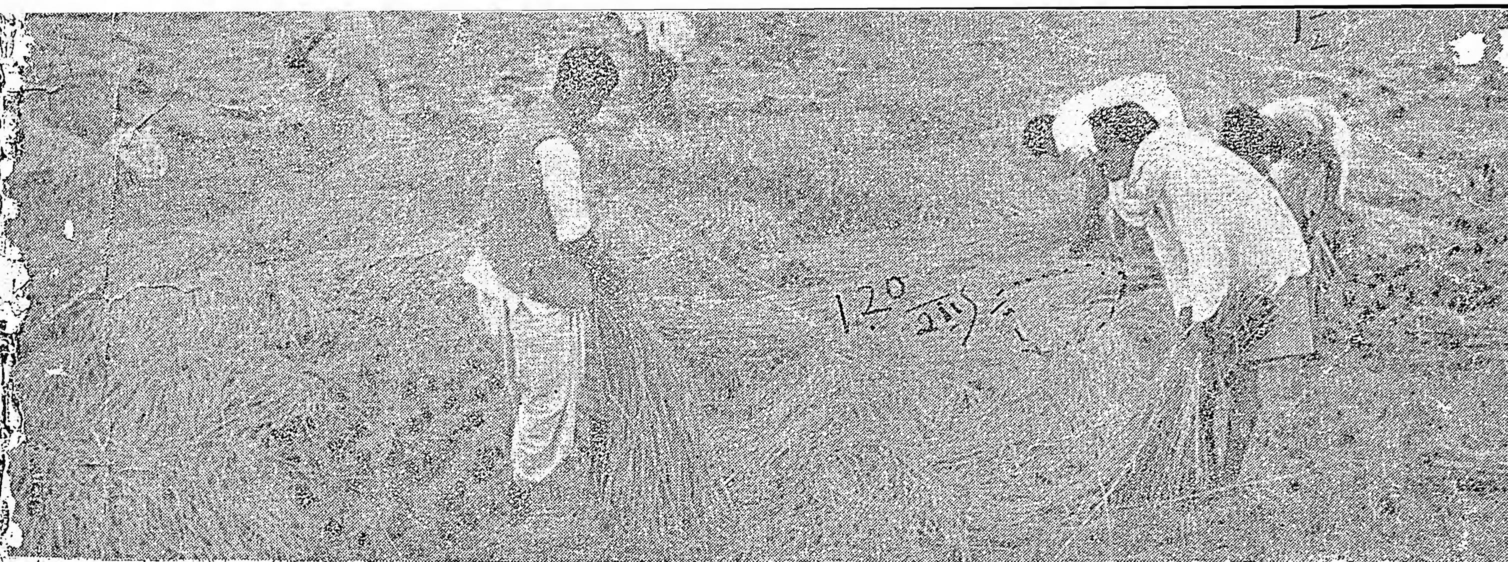
Broadcast End May-June
Transplanting Mid June-July

Seed rate : The usual practices of use of high seed rate is a national waste. The reduced seed rates not only reduce the cost of seed but also increase the yield by 3-5%. You are advised to use the following seed rates:

	Usual seed-rate per acre	Recommended rate per acre
Broadcast or drilling	80-120 lbs.	60 lbs.
Transplanting	60 lbs.	20-40 lbs.

In case of transplanting, it is only Madras State where seed rate is 40 lbs. per acre, while in the other states it is between 20-30 lbs. per acre. Use 2-3 seedlings per bunch per hole in all states excepting Bombay where 6-8 seedlings per bunch are necessary. The spacing should vary beteen 4″ × 4″ and 6″ × 6″ in all states excepting Bombay where it is 8″ × 8″.

If all the fa



not cost the farmer anything more by use of improved varieties. The farmer can increase his production by 1-3 mds. of paddy per acre. If the farmer has not succeeded to get the seed of improved varieties, he is advised to meet his nearest agricultural officer and seek his help in procuring the seed. In case he is unable to get the full quantity of seed, he may make a start with a small quantity this year. The produce of this quantity should be preserved for use next year. Many farmers are now using improved seeds and why not you. Some of the improved varieties for different parts of the country are given below:

VARITIES

W. Bengal : *A. Varities in circulation*

Bhasmanik, Patnai 23, Nagru 41/14, Jhingasail,

Badhalmkat-65, Badsha Bhog, Basmati, Seeta Sail 499,

Rupsail 859, Nonaramsail, Indrasail, Raghusail Sathissail.

Kal[illegible] .. Ajam: 246, Pahian 298, Tilak Kachary and A[illegible] *sing varities*

[illegible] area .. Culm-kati 147

[illegible]osabo area .. Patnarji 728/35 & Patnarji 746/36

3. For Bankura .. Two strains of Bran-culmkati.

[illegible] For Sari .. Dudkati

Assam (a) Broad[illegible] summer varieties—KMJ, D204-1, Lal Dumai, KMJ [illegible], Dhola-fali, KMJ-c 148-1, Chengri, KMJ-c 203-8 Chengri

(b) Transplanted Aus Autumn varieties K.M.J. A52, Kaseth, KM.J. AS. 46, Aus[illegible] KMJAS C-536-143 Aus Hyb. I.

(c) Sail transplanted water paddy: KMJS22, Lathi Sail, KMJ S156 Nagrasail, KMJSc 94-97 Hyb. 2, KMJSc-412-52 Hyb-4, KMJSc 1177-36 Hyb. 5.

(d) Asra shallow water Aman: KHJ ARI, KMJ ARI108-1, KMJ AR6358-148, KMJ AR 614-25B.

(e) Ahu summer paddy: TTB, AS86, TTBA S525, TTBA-S35, TTB. AS-20-1, TTB-AS 48, TTB-ASC.

(f) Sabi transplanted winter paddy: TTB SL 70, TTB. SL 115, TTB S. L. 126, TTB SL-311, TTB. S.L308-5, TTB, SL 202, TTBSL, 308-372.

(g) *Aman deep water paddy* H-BJ. Aman/2A 192, H. B. Aman/3A-38-12, HBJ. Aman/5A-51-1, H. N. J. No. 43 16-3.

Orissa Cuttack areas: (1) Laghu types T380, T608, T635

(2) Early winter T56, T442, T924, T118, T1145

(3) Mid winter T141, T312, T42, T426, T905

(4) Late winter T90, T165, T785, T885 T1242

Berhampur area (1) High land paddy for rainfed area — BAM 12 & BAM 13

(2) Paddy of medium maturity — BAM 1; BAM 11 & T-812

(3) Paddy of late maturity — BAM 3, BAM 6, BAM 9 and T-90

Jaipur areas	..	..	..J12, J1, J2-J7
Flooded areas	..	..	..FR 13A, FR43-B
Saline areas	..	..	..SR-B 26-B
Marshy lands	..	..	..ML1, ML-3
Pat areas	..	..	..D13, D14.

Bihar

Aus paddy: 2319 (BR16) and 5748 (B. R17) f upland areas in Chota Nagpur and Bhagalpur areas.

B. R. I. & B. R. 2 for intermediate class of lands the above areas.

Aman paddy: Early-115 B. K. (B.R.3) 141 B.

Aman paddy: Early1115 B. K. (B. R. 3) 1 (B. R. 4)

Medium 16 B-K (B. R. -5), 88 BK (B. R. 6)

Late 36-BK (B. R-7) 498-2A (B.R.8)

Fine paddy: T3, 818-3 (B.R.9) 300-15(B.R.1

Purple paddy: Purple Hyb: No. 23 (B.R.1

Purple Hy. No. 37 (B.R.12)

Flood resistant paddy: F. R. 13 (B.R.13)

Deep-water paddy: B. R. 14, B.R. 15.

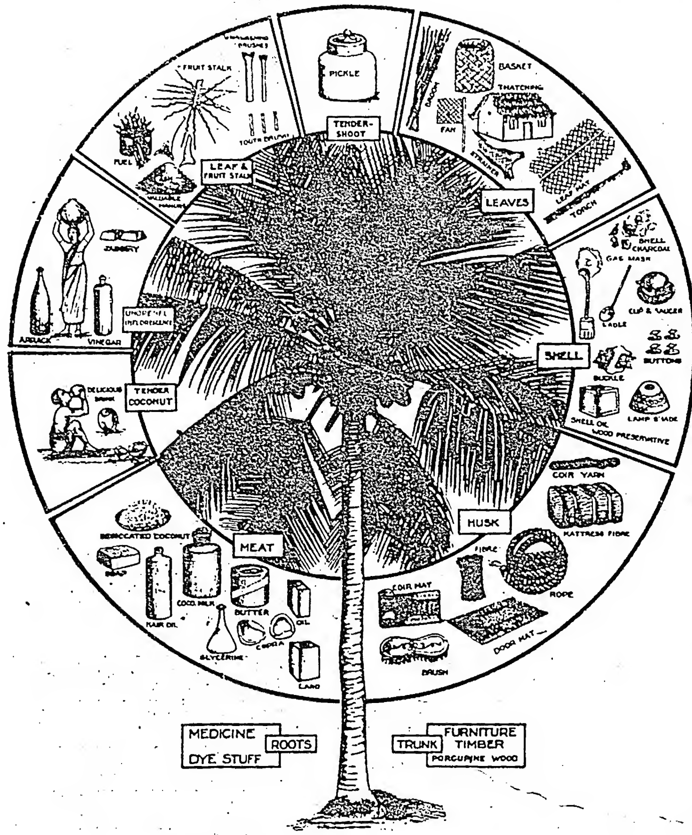
New promising varieties.

Sathi: Harnomeas-(white grain)

7-A5731-(Red grain)

Early Aman: 2/A-15, 13B/80, 10/8-46, 3/1385 13-V, 34A/60/-13, 13/S-16

(*Contd. on page 29*)



A poster illustrating the manifold uses to which the different parts of the coconut tree are put.

GROW COCONUTS and TEND THEM WELL
for
THEY BEAR ALL THROUGH THE YEAR
and
BRING YOU ASSURED & REGULAR INCOME

THE COCONUT INDUSTRY IN INDIA

K. GOPALAN, Secretary, Indian Central Coconut Committee, Eranakulam.

KALPAVRIKSHA

OF the 1.51 million acres under coconut in India, two-thirds are in Kerala and the remaining one-third distributed over the South Kanara, East Godavari, West Godavari and Tanjore Districts of Madras State and certain portions of the States of Mysore, Bombay, Orissa and West Bengal. At the present prices, the annual production of coconut in India is valued at about 78 crores of rupees. The "KALPAVRIKSHA" "The Tree of Wealth"—or the "Consol of the East", by which the tree is sometimes known, signifies the uses to which the different parts of the trees are put. In no part of India, however, does the tree so vitally influence the lives and fortunes of the people, as in Kerala, where it truly constitutes the staff of life on which millions lean. Preparation of copra, oil crushing, coir spinning and manufacture of mats and mattings are some of the important industries, which have grown round the tree and provide occupation and the means of livelihood to tens of thousands of people.

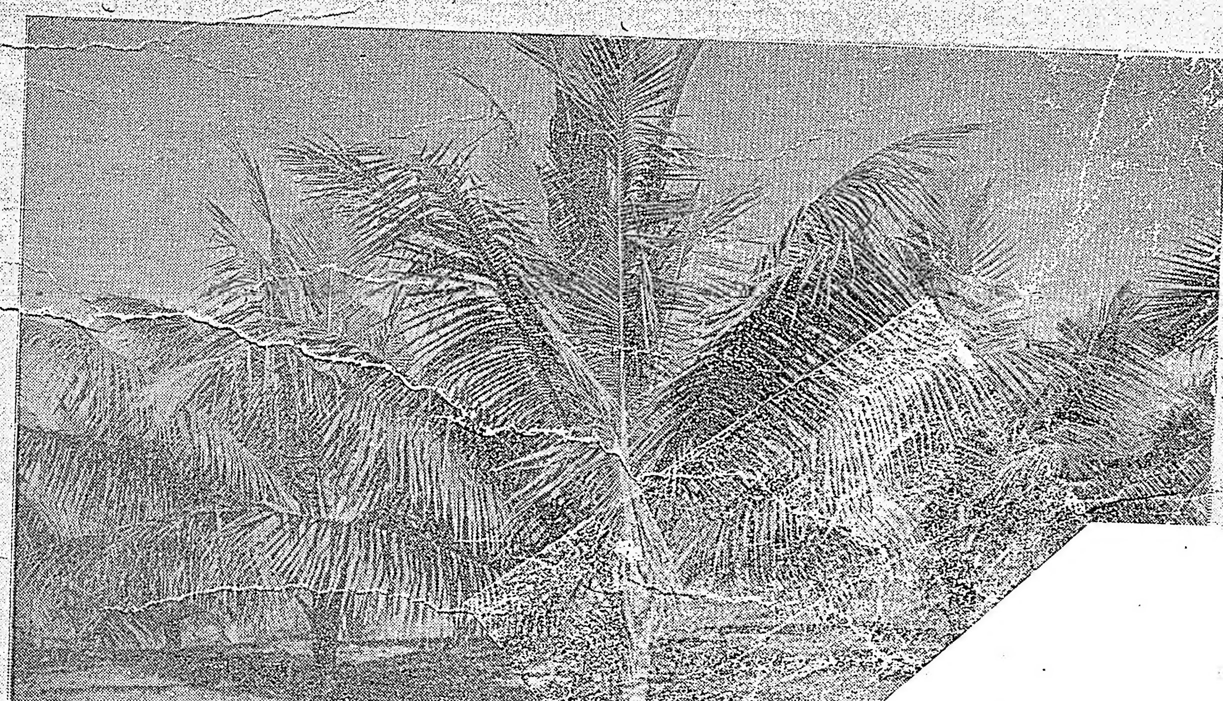
DEFICIT COUNTRY

In spite of the fact that the area under coconut in India is, after those of the Philippines and the Netherlands East Indies, the highest in the world, ours is a deficit country in coconut. Prior to World War I oil. About that time, as a result of competition from other vegetable oils and animals fats, Ceylon had lost many of her foreign markets and she was looking for new outlets for her surplus stock of coconut products. And in India she found a convenient market near at hand and her loss of exports elsewhere was made good by dumping large quantities into this country. Ceylon's good-fortune, however, spelt disaster to India. These large imports at "distress prices" had resulted in the catastrophic fall in the price of the local produce and great distress among the coconut growers in the country.

And as the World War II advanced, Ceylon lost almost all the European markets for her coconut products and she placed unusually large quantities on the Indian markets. This accounted for an all-time record net import of 1,84,329 tons (in terms of copra) of coconut products in 1940-41 or about 28 per cent of India's annual requirements. With the occupation by the Japanese of the coconut-growing countries of South-east Asia, the position was greatly altered. There was a demand from many quarters for Ceylon's coconut products and between 1941-42 and 1947-48 the distribution of the exportable surplus of copra and coconut oil in Ceylon came under the control of H. M.'s Government in the United Kingdom, who allotted to India only limited annual quotas. Since August, 1948, however, India has been making her own arrangements with Ceylon with regard to the import of her requirements of copra and coconut oil. Because of the limited quantities of coconut products available in the surplus coconut producing countries for export, India's imports have in recent years declined to an appreciable extent. But there is no doubt that if larger quantities were available, our imports of coconut products would have been on a much larger scale than at present.

COIR INDUSTRY

A Coconut nursery with seedlings 2 to 3 months old. There are at present 31 nurseries in different parts of the country financed jointly by the Indian Central Coconut Committee and various State Governments and having a total annual target of 4,95,400 seedlings. Pucca seedlings not less than 9 months old are sold from these nurseries at 8 annas each . . .



A CROP OF WILD SUNN-HEMP (SESBANIA STRITA) GROWN IN COCONUT GARDENS. WILD SUNN-HEMP IS A GOOD GREEN MANURE FOR COCONUTS.

coir fibre and coir goods. Our annual output during the last five years was of the order of about 1,32,600 tons of coir fibre, valued at about 15 crores of rupees. During the last five years India has accounted for an annual average export of 590 tons of coir fibre, 44,000 tons of coir yarn, 21,000 tons of coir mats, rugs and carpets, 4,000 tons of coir ropes and 3,800 tons of "coir other sorts". At the same time she has also distributed for consumption in India about 1,400 tons of coir fibre, 19,300 tons of yarn and 22,500 tons of coir products.

DEMAND FOR COCONUT OIL

It may be interesting to note some of the important reasons which have contributed to the conversion of the country from an exporter to a net importer of coconut products. For some years now there has been in the country an increasing demand for coconut oil to feed its growing industries particularly those connected with the manufacture of soap and toilet articles. Recent years have witnessed a large development of the soap industry in the country and "for making cold process soap coconut oil is the oil *par excellence*." The pre-war annual ...nsumption of about 30,000 tons of coconut oil in the ...ndustry has now increased to about one

... of imports during the period 1929 ... depressing the local price of ...onomic levels and this was ...neglect of their gardens by our growers. Manurial and cultural operations were seldom undertaken and there was practically no under-planting. Regular under-planting is an important feature of coconut cultivation for every year a certain percentage of trees go out of economic production due to old age and the decline in production is usually checked by a judicious system of under-planting when the trees are about sixty years old. During the depression period, because of the uneconomic prices of coconut, most growers could not spare the capital required for the under-planting and cutting and removing old and unwanted trees. As a result of the two-fold neglect of manuring and inter-cultivation and under-planting, the yield of the trees and the over-all production in the country had suffered a great set-back. The root and leaf diseases, which have affected the coconut trees in Travancore-Cochin, had contributed to make matters worse. About one-third of the area under coconut in the State has been so affected and the intensity of the incidence of the diseases may be appreciated from the fact that there is now an annual loss of about seven crores of rupees on account of the reduction in the yield of coconut caused by these diseases.

DEMAND AND SUPPLY

These and other reasons have combined to widen the gulf between the supply of and the demand for coconut products in the country. The short-fall in our production of coconut is as much as 25 to 30 per cent of our requirement. The world position of

oils and fats is also far from satisfactory and there is no prospect either of large imports of coconut oil becoming available in the foreseeable future.

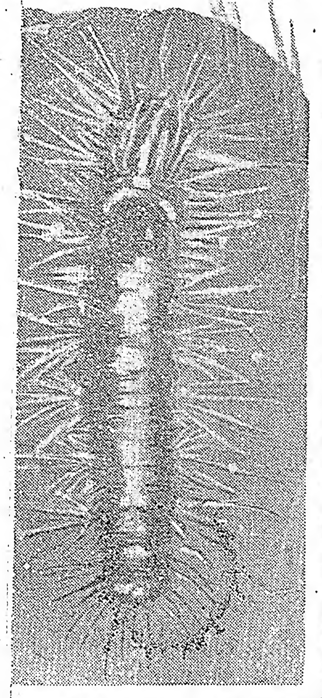
The problem of problems set before us is therefore how best to rehabilitate the industry and bridge the gulf between production and demand so that the industry may be placed on its own legs and be freed from the nightmare of foreign competition. The question of stepping up production may be answered by increasing the yield from the present gardens and by bringing more area under coconut. From the short-term point of view, the yield may be stepped up by adopting scientific methods of cultivation and giving the existing trees proper care and by timely control of the pests and diseases affecting them. Investigations have shown that by regular intercultivation and manuring the yield of the tree can be increased by fifty per cent.

The production and distribution of green manure seeds to produce green manure for meeting the deficiency in organic matter in the soil would also help to increase the yield. Re-planting or under-planting in bearing gardens when the trees are about 60 years old is also necessary to check the decline in production in the garden. From the long-range point of view the output of coconut can be increased by bringing new areas under cultivation. It is true that most of the land suitable for coconuts in the existing coconut growing tracts has already been brought under the crop. The area may, however, be extended by cultivating coconuts on virgin land at the foot of the Western ghats, on the embankments of irrigation canals and channels, on the margins of roads, on suitable lands on either sides of the railways, on the borders of rice fields and on the banks of rivers. State like West Bengal and Assam and the Andamans also afford a good deal of scope for coconut cultivation. The production can also be augmented by planting selected quality seedlings which when they grow into trees would yield about 50 per cent more nuts than seedlings of uncertain quality. In any case, the most resourceful method of stepping up the production immediately is to intensify the cultivation and make the trees grow two coconuts where one grew before, by proper scientific cultivation.

Our efforts to increase production can yield satisfactory results only with the co-operation of the thousands of small coconut growers. As a result of the present favourable prices of coconut and the intensive propaganda, the Indian Central Coconut Committee are carrying on, we may reasonably hope that the long-looked-for rehabilitation of the coconut industry in India, to which considerable damage was done during the thirties of the century, may be witnessed in the near future. This may help not only to ward off the evil effects of the dumping of foreign copra and coconut oil but also to restore the country to the status she enjoyed before World War I, as an important exporter of coconut products.

CHEMICAL WARFARE AGAINST INSECT ENEMIES OF CROPS

By Dr. S. PRADHAN,
Division of Entomology, I.A.R.I., NEW DELHI



PHOTOGRAPH SHOWING A PEST LARVA GATHERING ON ITS BODY SPRAY DROPLETS CONTAINING A CONTACT POISON.

NOBODY realizes more than the farmer himself that at every stage of his crop several agencies remain lurking to share the fruits of his labour. Of these, insects on the whole are easily the most formidable. Naturally the farmer all over the world has been waging war in a variety of ways against these perpetual enemies but in recent years the Chemical warfare against them has developed special tempo.

Chemical warfare as the name indicates consists of poisoning the enemy in one way or the other. This warfare against insect enemies however is different from that on the battle field. It is more like war against human diseases. Just as in the search for medicines one has to find out such chemicals as would kill the germs and yet have no bad effect on the patient, similarly for the control of the crop pests, as these insect enemies are called, we have to search for such chemicals as would kill the harmful insect but would not harm the crop or other useful plant or animal life in the vicinity. Thus it is a very delicate job. It so happens that the effects of chemicals on various forms of life are essentially similar. Hence it is difficult to find a material which is deadly poisonous to one form of life and absolutely harmless to another. To manipulate successfully, and on a large scale, the selective killing of our enemies and preserving our friends, when both of them are intermingled in nature, requires therefore the highest form of human ingenuity. This task is rendered possible only by investigating all the intricate aspects which go to make a chemical a little more poisonous to one form of life which we want to destroy than to the other which we want to preserve.

Such researches have been in progress in our country at Indian Agricultural Research Institute, New Delhi and a good deal of new light has been thrown on a number of fundamental aspects one of which is being dealt with below.

INFLUENCE OF PARTICLE SIZE

The chemicals which are found to be suitable for such delicate adjustments of their dosage, etc. so as to kill only the insect enemies without causing any injury to others are described as insecticides. It has differences in the size of these chemical particles contained in an insecticidal preparation greatly influence its effectiveness *i.e.* the toxicity of that preparation. But what so far kept the scientists confused was the actual manner in which favourable particle sizes could be attained. Some investigators observed that larger particles were more toxic than smaller ones while others observed just an opposite phenomenon *i.e.* that the smaller particles were more toxic than the larger ones. These different reports appeared to be quite conflicting and rather confusing. The work done at the Indian Agricultural Research Institute has made it possible to explain and fit in one connected story all these apparently contradictory findings. Two basic factors acting in opposite direction have been recognised.

BETTER CONTACT OF SMALLER PARTICLES.

Generally and inherently the smaller particles have been found to be more toxic than larger ones. This is so firstly because the smaller particles offer a larger surface area for contact with the insect body. Before a chemical can act on any living organism it must come in contact, in some form or the other, with the body of that organism. And for contact free exposed surface is necessary. The area of exposed surface increases with decrease in the size of particles. For example, when a particle is broken into two, two new surfaces get exposed.

The second cause for higher toxicity of smaller particles has been found to be the fact that smaller particles fit better in the uneven contour of the insect body surface. When examined carefully with the help of a microscope, the insect body surface is generally seen to be dotted or corrugated in a vast variety of patterns. What is relevant in the present context is that the whole surface is not in one level, there being regular or irregular elevations and depressions. The result is that if the insecticide particles happen to be larger than the width of these depressions, they are likely to get poised across the same touching the insect body only on the elevated points, there is no contact between the insect and the insecticide in the whole region of depression. This reduction in the toxic action of the poison. The smaller particles on the other hand do not suffer from this disadvantage and are therefore able to exert their full toxic action.

BETTER RETENTION OF LARGER PARTICLES

The primary effect of particle size *i.e.* smaller particles proving more toxic, is at times partially or completely masked by a number of secondary factors. Thus for example when a liquid containing poison particles is sprayed and the droplets fall on the insect body, the smaller particles contained in these droplets get drained off along with the liquid carrier whereas the bigger particles are retained on the insect's body in comparatively larger quantity. Again in the case of insecticidal dusts, the smaller particles drift away with the wind and comparatively larger particles settle down on the surface of leaves, etc. comparatively in larger quantities. The loss of insecticide due to such factors is more in the case of smaller particles than in the case of larger ones.

Thus from the point of view of better contact with the insect body, smaller particles are preferable but the particles must be retained on the insect body before they can have better contact and have more toxic reaction, and from the point of view of better retention larger particles are better. Therefore for success in practical control operations a very judicious compromise is necessary.

DELHI CAN GROW JUTE

By

J. J. CHANDNANI

&

D. CHATTERJEE

Indian Agricultural Research Institute, New Delhi

JUTE CROPS OF 1951

SINCE the partition of India in 1947, about eighty per cent of the jute growing areas of Bengal became part of Pakistan, and one of the many recommendations suggested by the Indian Jute Committee to overcome the immediate shortage of jute in India, was to increase the acreage of jute and to extend the area of cultivation to other States. Although jute is known for its adaptation to very moist conditions of Bengal, Assam and Bihar, it has been recently grown in some regions of Madras, Travancore, Uttar Pradesh and Bombay. Recently it has also been reported that good quality jute was grown in Karnal, in the Punjab, which is a fairly dry region but has facilities for irrigation. Possibilities of growing jute under irrigated conditions in Delhi was explored at the Indian Agricultural Research Institute, New Delhi, for two successive *kharif* seasons (1950 and 1951) and the following account gives a summary of the botanical and agronomical results obtained and also gives an idea of the prospects of growing jute around Delhi.

While conducting a survey of the weeds of the crop fields of the Institute, a number of wild relatives of jute were noticed in the *kharif* season of 1949. These include such species like *Corchorus tridens, C. acutangulus, C. trilocularis, C. depressus* and a wild form of *C. olitorius*. Wild forms of jute have also been noticed in some low lying areas in Delhi State. Some of the wild species were transplanted to an experimental plot for further study, and for the sake of comparison, a few types of cultivated jute were also grown. With the exception of one type, all the seeds of the cultivated jute were obtained from the Director, Jute Agricultural Research Institute, Hoogly, West Bengal.

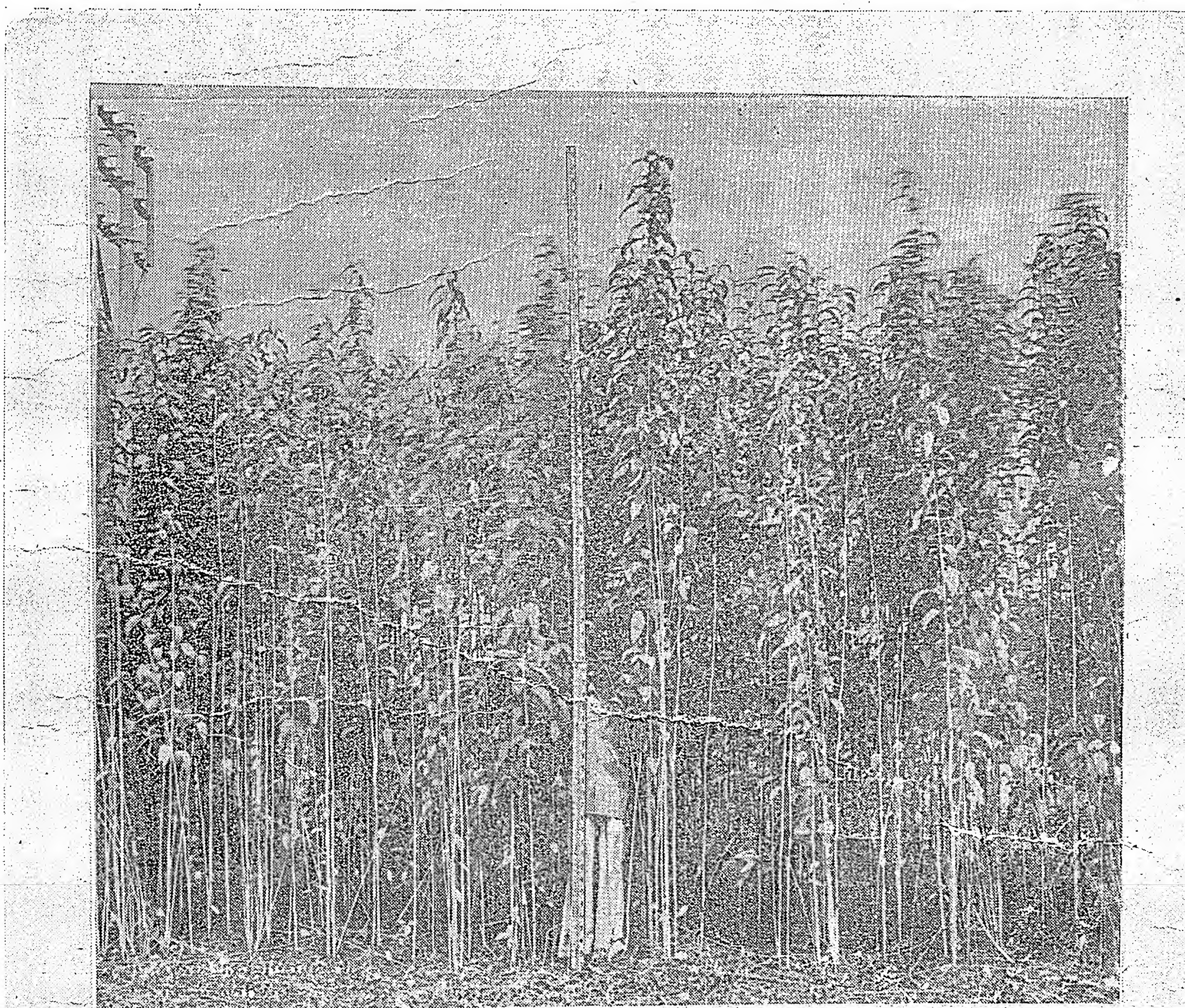
Twelve cultivated types of jute were grown as shown.

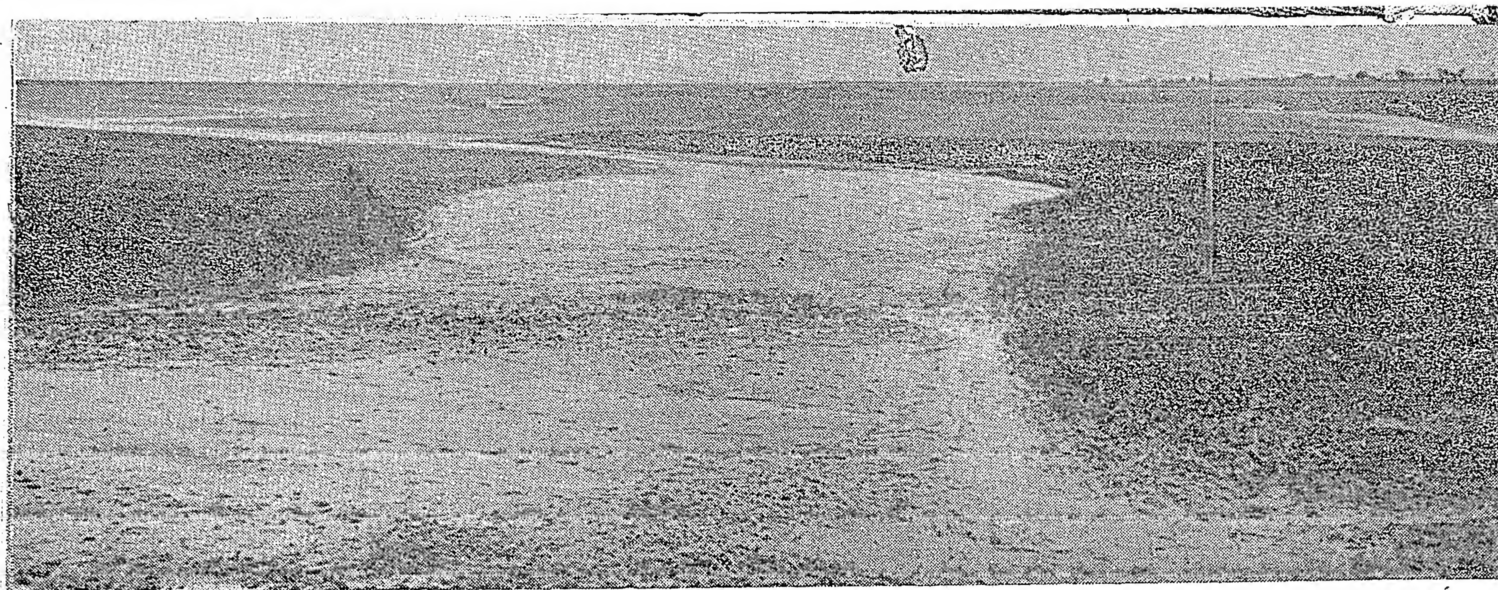
The work in the Institute has been mainly directed towards the finding promising varieties suitable for Delhi conditions with respect to their yield of fibre and seeds. It has to be admitted that although the crop was grown for two seasons, the trials are to be regarded as small-scale trials. Seeds were sown on the 10 May and on 25 May, 1950

on previously irrigated lands. The crop was harvested at the end of October and the beginning of November. The rainfall during May to August 1950 was 20.3 inches against the normal of about 15 inches. The crop attained the average height of ten feet which may be regarded as very good. In some cases the maximum height attained by some individual plants was near thirteen feet. The yield of seed obtained was 11 mds. per acre from an area of 1/40th of an acre. In 1951, the weather was comparatively dry and the rainfall during May to August was only 6.5 inches against the normal precipitation of 15 inches. But this year also the crop with a few irrigations grew very well. The fibre obtained gave a calculated yield of 11.7 mds. against the average yield of 12 mds. in Bengal. The fibre was examined by the Director, Jute Technological Laboratories at Calcutta and has been reported to be of good quality and well-retted. Much better yield of fibre was however obtained in one variety in 1951 in another agronomic trial.

Work on the cost of production of jute fibre and the economics of cost of frequent irrigation and extraction of fibre in Delhi area, remains to be done. But as a result of growing jute for two successive seasons in Delhi, it seems clear that the crop can be profitably grown for seeds for which there is considerable demand. As a matter of fact a large quantity of seeds sown in Bengal are actually grown in comparatively drier parts of Bihar and transported to Bengal every year. While the average yield of seeds obtained in Bengal varied from 4 to 5 mds. per acre, the calculated yield for the types grown in the Institute have been much greater. The possibilities of growing two crops—jute and wheat, on the same field, in the same year are being explored to avoid competition between food and cash crops.

Work carried on the selection of types suited for irrigated regions around Delhi suggests that I. C. 326, I. C. 327, and 0-40-753 of *C. olitorius* and I. C. 328 and I. C. 329 of *C. capsularis* appear to be suitable for Delhi. All these types would grow to heights of over 10 feet with normal care and attention.





Soil erosion in unprotected field

FLOODS & DROUGHTS IN MADRAS STATE

By

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and

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DROUGHTS are caused not only by the general deficiency of rainfall but also by unequal distribution. Drought acts slowly but flood takes us unawares causing sudden destruction.

A study of the past records reveals that Madras State had periodic visitations of floods and droughts for generations and that in one part or other of our State drought conditions affected the crops in almost every year. Even in a place like Coimbatore District, where rainfall is said to be well-distributed, even though scanty, many a year was not satisfactory from the ryot's point of view. Every district has such a woeful tale to tell.

To study and combat drought it is always desirable to divide a State into convenient zones. Thus from the point of view of drought, Madras State can be divided into 4 main divisions, namely,

(*i*) Humid zone having a rainfall of more than 100 in. comprising the districts of Malabar and South Kanara.

(*ii*) East Coast Region—with a large portion of the annual rainfall of 40 to 50 in. received during the North East Monsoon period and liable to flooding by cyclones.

(*iii*) Semi-arid region with an annual rainfall of 30 to 40 in. comprising of North Arcot, South Arcot, Salem, Coimbatore Tiruchirappalli, Mathrai, Ramanathapuram and Tirunelvelli districts.

(*iv*) Arid region with less than 30 in. rainfall.

The precautions and the remedial measures against droughts vary in the different zones. The humid zone comprising of the districts of Malabar and South Kanara with an annual rainfall of more than 100 in. received mostly during the South-West Monsoon period is not generally liable to drought as utter failure of the monsoon does not seem to have occurred. Crops are generally grown only during the rainy season and this area is marked by lack of any permanent irrigation system.

In the East Coast districts more rainfall is received during the North East Monsoon, than during the South West Monsoon period. Further, there are the recognised irrigation systems of the Godavari, the Krishna and the Cauvery and in these deltaic tracts failure of crops due to failure of local rains is generally unknown.

With the advent of the anicut at Dowlaishwaram and Mettur we have mostly conquered drought in these tracts thus ensuring regular supply of water. Easy and quick communications afforded by modern transports have nullified local famines caused by droughts.

The semi-arid region which occupies a major portion of the State with a rainfall of 30 in. to 40 in. per annum has suffered very much in the past due to drought. This one being mostly fed by tanks and wells is now more easily susceptible to drought due to the long neglect of the ancient tanks and wells which feed this region.

The arid region with an annual rainfall of less than 30 in. is affected by drought every year in either one part or the other. The rainfall received here is also ill-distributed. Fortunately the average annual rainfall is not less than 20 in. in this tract, which when properly tackled may be enough to raise a crop successfully each year.

This calls for the co-ordinated efforts of the ryot and the Government to conserve all the available soil moisture, mainly by preventing surface run off and adopting improved methods of dry farming like strip cropping, ploughing along the contour, etc. The

STRIPPING-CROPPING :—*Alternate strips of cotton and cereal across the slope to protect the soil.*

methods adopted for conservation of soil moisture help also in the conservation of soil itself and thus the benefit is two-fold. By conserving the soil itself a lot of silt is saved in the soil from erosion and this goes a long way in nourishing a successful crop. Well tilled and well fertilized fields are known to yield well even during times of drought. This shows that drought can be combated by the judicial manuring of the fields. Cattle manure and well rotten composts may be used with great advantage. As cattle manure will not suffice for such a vast area, recourse should be taken to organic compost.

With the construction of contour bunds in dry areas as a soil and moisture conservation programme vast scope is open to the ryots of the arid tracts to improve their cultivation.

The ryots can grow successfully green manure crops particularly of the leguminous type like the Kudzu, wild Soyabean, etc. near the bunds and compost them to be used as manure for the remaining area.

All this will involve co-operation of the ryots of the tract and this can be easily accomplished only by running large Demonstration Farms in each *taluk*, so that ryots can themselves see the benefit of adopting such improved methods.

Damage is done to crops not only by drought but also by floods which take us unawares. As far as Madras State is concerned only the east coast districts are liable to damage either by river floods caused by excessive rains in the catchment basins of the Godavari, the Krishna, the Cauveri, the Vaigai and the Tambraparni, or by cyclonic floods caused by cyclonic storms which generally cross the coast during the North East monsoon period causing widespread damage. The river floods are mostly seasonal and damages are caused only by breaching of bunds of the rivers and tanks, which have to be well protected in order to avoid damage. For this purpose nothing is cheaper and more effective than the protection afforded by grasses. Kusa grass (*Saccharum spontaneum*) ranks foremost in protecting river bunds. Other grasses of importance are giant star-grass, *Panicum antidotale*, *Brachiaria mutica*, thin Napier, etc. These grasses bind the soil and keep the bund intact. Planting of grasses on river bunds can be easily done by the co-operative effort of the villagers on the banks of the rivers.

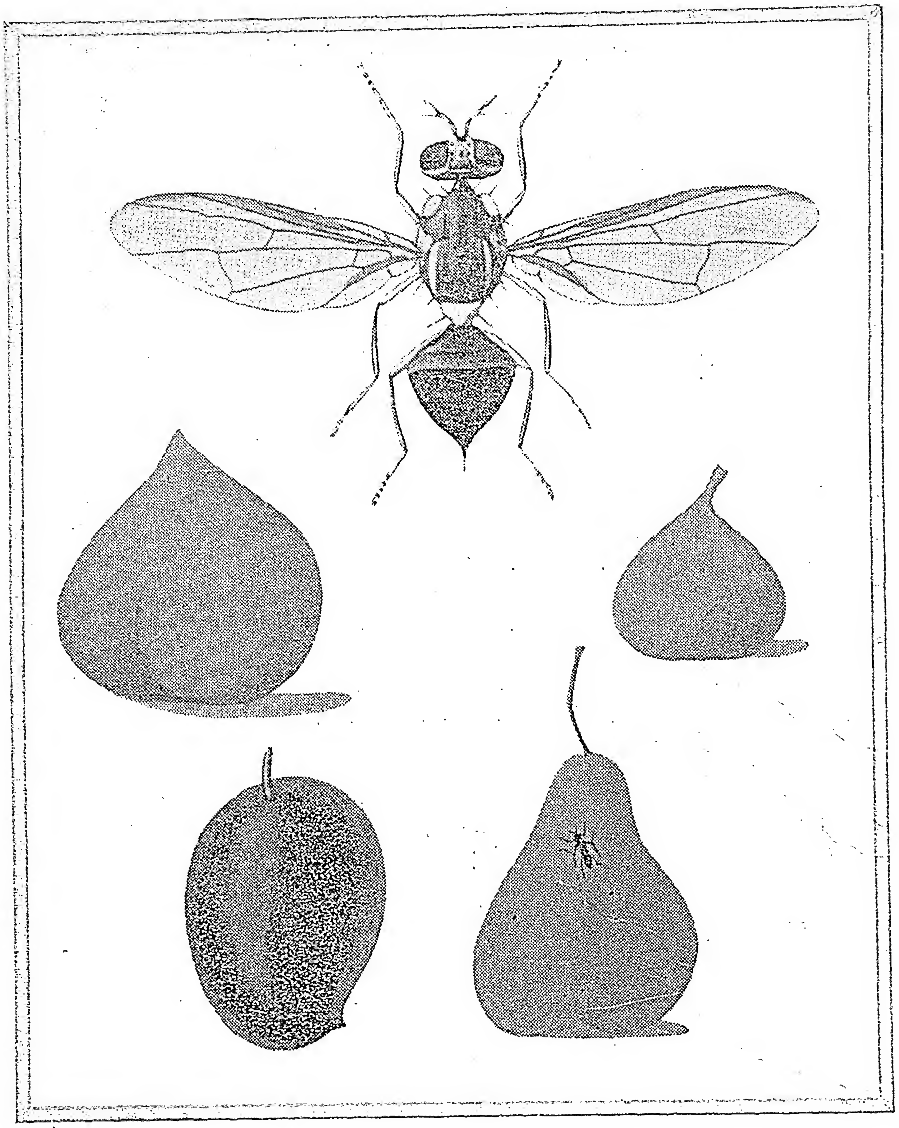
Moreover, river floods occur due to sudden discharge of large volumes of water into the rivers from their catch[illegible] ment [illegible] vegetation, which nature took centuries to create. The only remedy is to plant trees in the upper catchment basins and raise new forest belts so that the rain water received is discharged slowly through perennial streams ensuring a regular supply of water to our great reservoirs and also increasing springs in the wells by gradual seepage. At the outset several small reservoirs should be constructed in the upper catchment areas across the existing streams so as to store water and help afforestation.

Similarly, for the East coast districts in order to reduce the ravages on the cyclones several quick growing Casuarina belts should be raised parrallel to the coast line at convenient intervals.

CORRIGENDA

February 1952 issue of the Indian Farming, page 17 line 13 from below for '22 mds' read '2½ mds.'

March 1952 issue of the Indian Farming, page 3, under cover picture No. 2, line 2 for 'produced at....' read ', produced potatoes at....'.



THE MANGO-FRUIT FLY AND ITS CONTROL

By H. N. BATRA, Technical Officer

and

P. L. RENJHEN, Assistant Locust Entomologist, Directorate of Plant Protection, Quarantine and Storage, New Delhi.

IN India the mango fruit fly (*Dacus ferrugineus Fabricius*) has been recorded from the Punjab, Delhi, the Uttar Pradesh, Bihar, West Bengal, Madras and Central Deccan Plateau.

HOST PLANTS

The host plants of the pest observed in India and Pakistan are numerous. Some of them are mango, guava, loquat, apricot, plum, *alubukhara*, peach, pear, apple, etc. When these fruits are not available the fly infests chillies, brinjal, etc. to continue its race.

NATURE AND EXTENT OF DAMAGE

The dark or greenish dark, circular punctures are visible on the surface of attacked fruits. Syrupy fluid oozes out from the fruit at the point of puncture. The fruits ferment and decompose as soon as the worms feed on the pulp within, with the result that rotting patch appears on their surface. The colour of rotting patch is brownish in citrus, mango, apple and apricot and black in pear and plantain. The guava fruit is rendered spongy. The infested fruits fall prematurely. One or two cricular holes are visible on the fruit after the worms have left it for pupation.

It has recently been recorded that damage caused by the fly in gauva fruit grown in Delhi is over 80 per cent. The extent of damage is on the increase.

LIFE AND ACTIVITY OF FRUIT FLY

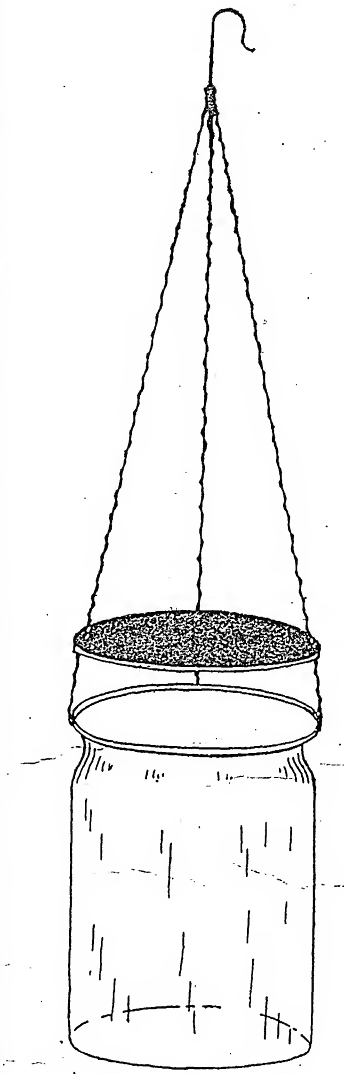
The female fly at the appropriate stage punctures the fruit with the pointed end of the body and inserts shiny white elongated eggs in clusters of 2-11 under the skin. As many as a dozen of such punctures have been located in a single fruit in September-October, the peak period of the fly. About 200 eggs have been counted as laid by a single fruit fly. The egg stage lasts 1-2 days in summer and 10 days in winter. A white maggot hatches out of the egg and slowly penetrates into the interior of the fruit. Normally the number of maggots in each fruit is under a dozen but in extreme cases the number may be over 100. The larva is of active habit and finds a suitable place for pupation which takes place at a depth of 3-7 inches in loose soil.

The pupa is light brown when freshly formed. Later it becomes deep brown and as it ages it assumes straw colour. The pupal stage lasts from six days in summer to 44 days in winter.

The adults live for about a month. The shortest life-eycle from an egg to the emergence of the fly is 13 days in September and longest of 74 days in winter.

SEASONAL HISTORY

The pest has several broods in a year. In the hills it is more active in summer when the pest is met with in all stages of its life owing to overlapping brood. It over-winters in the pupal stage. In the plains, its activities have been observed as under :—



IMPROVISED TRAP

January-March	Citrus and guava
April-June	Loquat, apricot and plum
July-September	Fig, mango, peach, pear, apple, pomegranate and guava
October-December	Plantain, *alubukhara*, Persimmon, quince, citrus and guava.

It is thus clear that owing to the abundance and succession of fruits, the fruit fly breeds almost all the year round.

The adults swarm under the leaves of fruit plants such as citrus, guava, loquat, etc. These swarms can be noticed under undisturbed leaves from dusk to sunrise in the early days of winter but may be seen even upto mid-day when it gets colder. During the course of the day as the temperature goes up the flies disperse and move [illegible] leaf i[illegible]

CONTROL MEASURES

An infested fruit is invariably the source of further infection on account of the increase in number of the fly. All such attacked or fallen fruits should be buried in a deep pit, two feet below the soil surface. The earth in the pit should be thoroughly rammed. The operation requires close and rigid supervision in orchards. Flies escape if fruit is not buried deep or when the earth has not been rammed properly. There is always present in every orchard a quantity of fallen fruits. Fruits unfit for the market, etc. should be destroyed as soon as possible. The practice of keeping these in heaps about the orchard is not proper as such fruits attract fruit fly by their smell into an orchard hitherto free from it.

Weeds and grasses under the trees in the orchard should be removed as their presence renders it probable to miss individual infested fruits or wind falls when collecting them.

A few fruits are left over on the trees after the harvest as under-sized and unripe or are missed from picking. Picking of fruits should be thorough and not a single one should be overlooked and left on the tree; otherwise unpicked fruits will serve as centres of infestation.

Where pitting is not practicable or economical, boiling the infested fruits in water for an hour kills all the worms.

It has been observed that negligence towards these operations is responsible for the breeding of a good number of fruit flies towards the end of the season. Thus proper sanitation of the orchard is the first essential for keeping the pest under check.

SPRAYING

The usual habit of the flies of swarming under the leaves may be taken advantage of to control the pest by spraying with Diesel oil-soap-emulsion. The stock solution was of the following strength:

—Diesel oil ..	.. 1 gallon
Soft soap ..	.. 1 lb.
Water ..	.. 1 gallon

The stock solution diluted eight times with water was used as spray. The spraying operation can with convenience be carried out by means of portable Four Oak's Knapasack Sprayers of 2-4 gallons capacity with working pressure of 60 lb. to a square inch.

Chemicals such as liquid ammonia, Vanilla oil, Pollard mixture (Bran 8 oz., Borax 8 oz. Water 1 gallon), Citronella oil, Clensel, etc. are some times used to attract insects. It was found that Clensel attracted 50 to 60 per cent of females. The Clensel in improvised traps costing about annas five each, used in the a ratio of 1:20 with water gave satisfactory catches upto ten days. The attractant should then be changed. In a big orchard the cost and care of traps is a matter of consideration. The traps are filled with the diluted Clensel to two-thirds of their capacity. These traps are useful in summer only. They should be taken off in winter. Clensel trapping is effective only when persistently tried for a number

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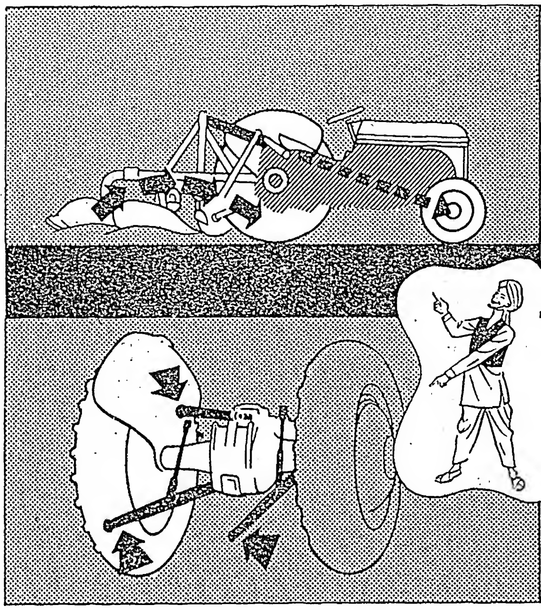

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On most tractors the implement, when in work, makes the front wheels tend to rise up unless extra weight is added. Moving this extra weight means that a lot of power is wasted. But the Ferguson System needs no extra weight. All available engine power is used on the farming job itself.

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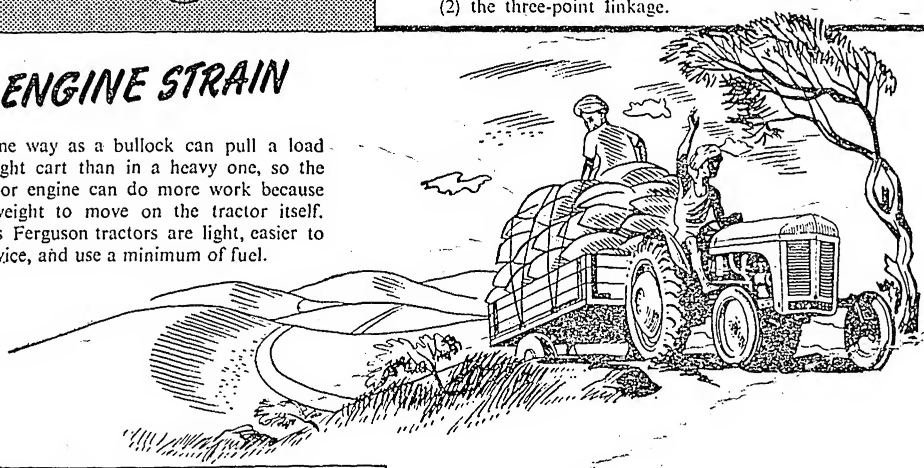
In just the same way as a bullock can pull a load further in a light cart than in a heavy one, so the Ferguson tractor engine can do more work because there is less weight to move on the tractor itself. Because of this Ferguson tractors are light, easier to handle and service, and use a minimum of fuel.



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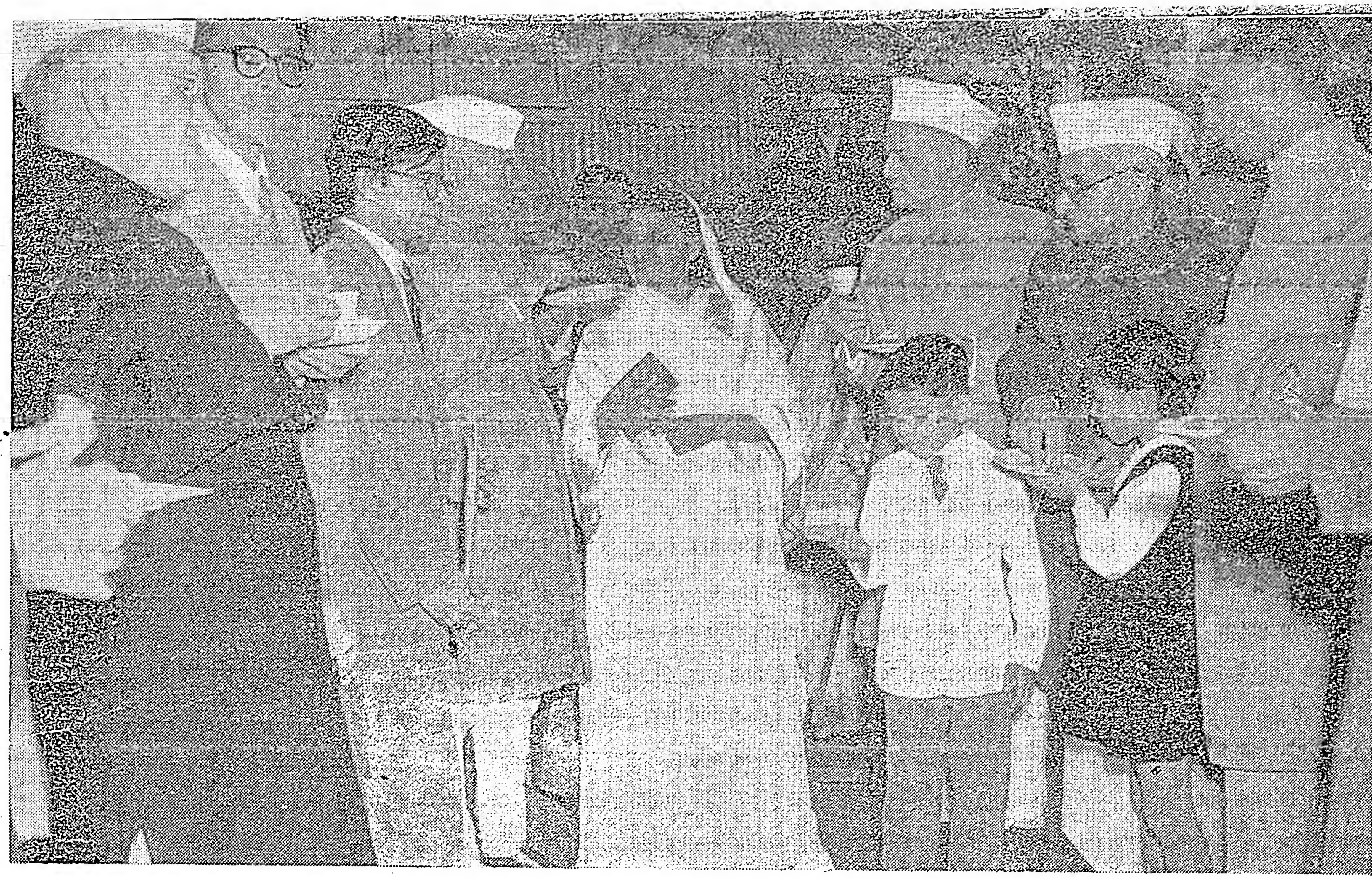


ANNAPURNA—New Delhi's Non-Cereal Cafeteria. At Home to Members of Parliament.
L—R. Shri Jaspat Rai Kapur, Dr. U. N. Chatterji, Shri M. M. Lall, Dr. K. N. Katju, Shrimati Lilavati Munshi, Shri G. V. Mavlankar, Shri K. M. Munshi and Dr. B. V. Keskar.

THE ROLE OF THE SALAD IN OUR DIET

By RAMPA PAL

IN India a Salad dish is generally understood to mean a mixture of boiled beets and potatoes, tomato and onion rings sprinkled over with a dressing of vinegar, olive oil, pepper, mustard and salt and garnished with lettuce leaves. Very often sliced boiled egg is added.

At the beginning of the century, tomatoes were rather rare. Now they are as common as potatoes and as popular too—nearly everyone relishes them as a drink, in salads, and as a cooked dish while in hotels and restaurants tomato sauce and tomato ketchup are always at hand.

America, perhaps, is the only country where the housewife has made a fine art of the salad. The artistry and colour that she creates in a salad dish is a feast for the eyes and an accelerator for the digestive juices.

In Australia in the big cities there are restaurants where only salads are served and catered for. These salad restaurants are much patronised by the office workers in need of a very light midday meal.

The people of Burma, on the other hand, are so fond of salads—there they are known as 'thoats'—that they musi[illegible]

food. They prepare salads in a variety of forms out of legume sprouts (especially moong or gram sprouts), tender greens (coriander, dhaniya, karela, lobia, radish, neem leaves, boiled beans, potatoes, etc.) The delicious salad made of the green papaya fruit is sold on wayside booths, itenerant hawkers whenever a mela or 'Pwe' or a drama is on. These salads are served in the simplest form in banana leaves. Fish paste or prawn powder is their chief masala. Lime juice, chilli powder, roasted gram powder, til oil and salt form the dressing for most of them. Soya bean sauce is often used also.

A good many Indian ladies now-a-days include a dish of salad in their lunch menus but most of them still are echoes of the European Salad dish with identically the same ingredients—lettuce, tomato, beet, egg, flavoured with vinegar or mayonnaise. There are certain dishes in our Indian dietary which could easily be served up as pure salads or as salad meals whenever a quick lunch has to be prepared.

The time has now come for us not only to modify and change our food habits but also to plan our menus s[illegible] that a meal is balanced to contain the requisite amoun[illegible] of calories and vitamins. Lack of vitamins [illegible]

There are many of soft materials and unwholesome combinations of food in our meals which result in maladjustment of the gastric processes. The well-to-do over-eat being able to afford rich and highly spiced food while the poor are under-nourished because their small wages are not enough to make ends meet.

The deficiency diseases are on the increase especially in the congested cities and the contributing factors are lack of sunshine and fresh air plus the stress and strain of living as well as ignorance of food values and nutrition.

In the countryside, old and young enjoy eating raw tubers like radishes and carrots and sucking fresh sugarcanes in the winter and in the summer *bers*, mangoes and jamans are popular. The kakri and cucumber are plentiful and cheap. The country people eat fruits and vegetables according to season. The city folk, on the other hand, have spoilt palates and demand all sorts of food-stuffs in and out of season with consequent gastric derangements.

Indian diets do not have a separate salad dish but if we study their composition it will be noticed that a great many of the vitamins and calories are there in some form or other. Salads are not usually served separately. But the homely chuntney made out of coriander (green dhaniya) leaves, mint leaves (pudina) and curry leaves (meetha neem or *Murraya Konigi*) a tiny lump of tamarind pulp or anardana (seeds of the sour pomegranate) or even a fresh amla fruit, green chilli, fresh ginger, onion, black pepper is not only delicious but also contains quite an appreciable combination of both vitamins and calories. A simple salad of diced or long pieces of cucumber or finely minced (or thin rings) of onions and tomatoes seasoned with limejuice, pepper and salt are also very popular.

The so-called spices which form an integral part of our seasoning of salads, pickles and cooked food really have high food values apart from being digestive aids and intestinal disinfectants.

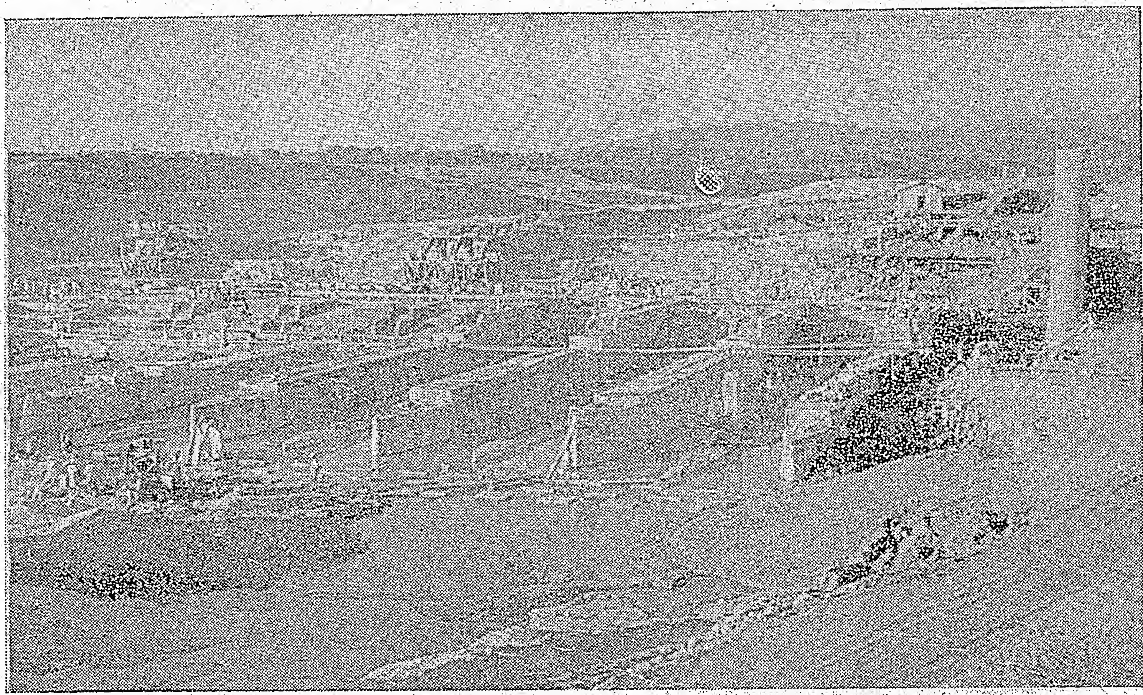
The poor man's spices are the red dry chilli and the onion which, in Delhi State, is the main ingredient in a simple roti diet. The chillies not only give flavour and colour to his one dish of dal and roti (or rice) but add calories and vitamins as well.

Indian diets which have not changed for thousands of years must have been found wholesome and nutritious. The ancients had certain standards in their diet. Each region had its own food composition according to its climate and supply of food materials. Then there were simplicity and moderation. Pickles and puddings were never served together nor were fried food so commonly eaten.

The wealthy in many cases lead sedentary lives and possibly over-eat rich and soft foods, causing ailments. The poor have not enough to eat and have to work hard and yet are robust in health.

Recently the Ladies' Association of the Indian Agricultural Research Institute, New Delhi, organised an Exhibition of Salads which was opened by Mrs. K. M. Munshi. Forty salad dishes, chiefly Indian, were on view and prizes were awarded for decoration, tastiness and for the highest vitamin content and calories. It was probably the first of its kind ever held in India and was quite a success.

The modern salad dish has come to stay and it is for us to make it a regular addition to our menus and popularize its value as food.



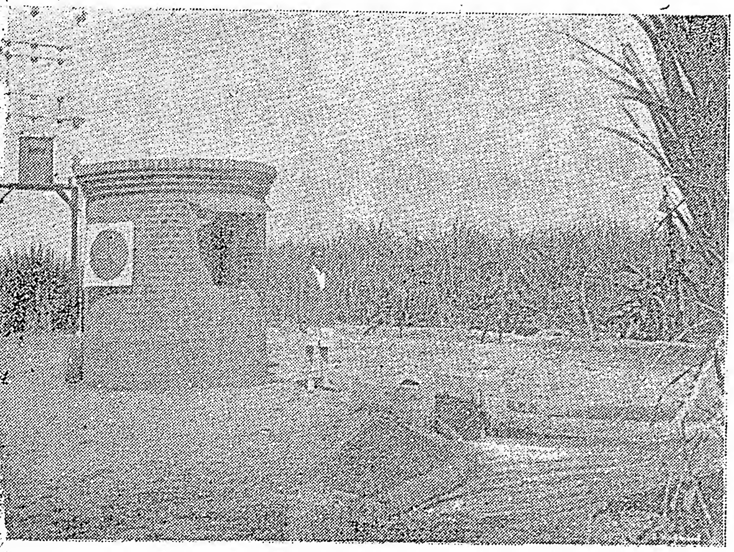
NANGAL DAM UNDER CONSTRUCTION.

AGRICULTURAL DEVELOPMENT IN PUNJAB

WHEN the Punjab was cut into pieces due to the partition and suffered untold miseries owing to the refugee influx, few could have forseen that the relatively less fertile part of it falling within India and known for decades as deficit area would, within the space of a few years, become surplus and play a great part in relieving famine in the rest of India. This spectacular achievement has been made possible by a unique combination of official effort and the hard and unremitting toil of the sturdy Punjabi.

At the time of partition, Indian Punjab got 44% of the total population of undivided Punjab, but only 38% of the cultivated land. Even this land was of doubtful potentiality, because only 21% of the irrigated land of undivided Punjab fell on the Indian side. The population of Indian Punjab was about 12 millions or so, but it was augmented suddenly by the influx of nearly a lakh of refugee peasant families from Pakistan. The geographical area of the State is about 23.9 million acres, of which the cultivated area is about 13.8 million acres. The density of population is therefore about 342 persons per sq. mile or about 2 per acre. The agricultural population constituting about 82% of the to...

The redeeming feature of the situation was that there were about 1.2 million acres of land which were definitely culturable and could be brought under cultivation without too much expense. There were also several lakh acres of land abandoned by Muslim evacuees. But the exploitation of this land required preliminary steps by way of reclamation by government effort, arrangements for mechanical cultivation where there was scarcity of labour, and of draught cattle and allotment of lands belonging to absentee landlords. The Government took up this work with great vigour and in 1950-51 alone over 1,16,000 acres of new lands were brought under mechanical cultivation. In order that large refugee farmers can purchase tractors of their own and do mechanical cultivation, a loan of Rs. 40,00,000/- was sanctioned by the Central Government to the Punjab Government for the purchase of nearly 400 tractors at the rate of Rs. 10,000/- per farmer and this has also helped to speed up the reclamation of fallow and uncultivated lands. Large areas of cultivable lands in the Karnal District of the Punjab (I), which were lying fallow for some time, where also acquired from their absentee landlords and allotted to suitable agricultu... in the steady increa...



A TUBE-WELL WITH THE MEASURING TANK AND A RURAL TYPE TRANSFORMER IN UTTAR PRADESH.

in the area under cereals in the State, which has been going up by about 3 lakh acres every year since partition.

Since one of the main drawbacks of agriculture in Indian Punjab after partition was the relative lack of irrigation facilities, Government have been devoting considerable attention to both major and minor irrigation projects. The great *Bhakhra-Nangal* project, which is expected to be completed by 1956, is planned to irrigate an area of about 4 million acres in addition to the generation of cheap electricity for certain parts of the Punjab, PEPSU and perhaps Delhi also. Work on the Sindhwan Canal which has already been opened and which, when completed, will irrigate about 5 lakh acres including 2 lakh acres of new lands, is being pushed forward. This project alone will give additional production of about 7 to 8 lakh tons of foodgrains. In addition to these major projects, a number of short term irrigation schemes have been taken up. The extension of the Bhiwani Distributory and the lining up of its canal, the excavation of the Kasur Branch Distributory and the raising of the banks of many other channels are being done rapidly by the Punjab Government with the assistance of the funds provided by the Central Government. Work is also in progress in extending irrigation in the Kangra and Kula Valleys, where nearly 43,000 acres of land have been brought under fresh irrigation with an additional yield of nearly 9,000 tons of foodgrains.

The underground water resources of the State have also been taken up for development. The Irrigation Department have made a contract for the construction of 256 *tubewells* with an English concern called M/s. Associated Tube Wells Ltd. These wells will be completed before the 31st December, 1952 and are expected to give an additional production of at least 100 tons per well i.e. 250,000 tons. In addition to this contract with M/s. Association Tube Wells, the Agriculture Department is also going ahead with the construction of tubewells by private parties and have completed about 109 wells upto 30th June, 1950.

Land and water, although they are essential prerequisites to the increase of agricultural production, are not enough by themselves. It is equally important that improved seeds and manures should be utilised and that correct cultural practices should be followed by the cultivators. Under the G. M. F. Campaign, subsidies are being paid for supply schemes such as distribution of manures, improved seeds, compost etc. The Punjab is also noteworthy for having passed and implemented effective legislation for bringing uncultivated land under the plough and ensuring the adoption of correct cultural practices by the cultivators. For example, the East Punjab Utilisation of Lands Act, the East Punjab Tractor Cultivation Act and the East Punjab Reclamation of Lands Act, all of which were passed in 1949, enabled the Government to take over uncultivated land, bring them under mechanical cultivation and to hand them over to farmers who are willing to do the cultivation. During the same year the East Punjab Conservation of Manure Act was passed, which makes it incumbent on the farmers to conserve their manure to compost it and to apply it on their lands.

The result of the various measures described above has been spectacular. During 1949-50, the Punjab achieved an extra production under the G. M. F. Campaign of about 40,000 tons of foodgrains, thus outstripping the target of 25,000 tons. During 1950-51, the target was nearly 44,000 tons and there is little doubt that it has been fulfilled. During 1950-51 alone, about 3,500 wells were dug and 1,400 water lifting appliances were installed. The target for 1951-52 has been fixed at 1,18,000 tons and there is no doubt that it will be fulfilled.

The achievements of the Punjab since partition show what can be done when proper planning and execution at official levels is backed by the enthusiasm and labour of the average farmer. With the efforts of the last few years, Punjab has already turned from a deficit State into a surplus one and if this effort and rate of progress are kept up, there is no doubt that it will once more regain its place of pride as the granary of India and will help us to win our freedom from foreign bread.

—S. T. RAJA,
Deputy Secretary to the Government of India, Ministry of Food and Agriculture.

PRIZE FOR VILLAGE GHANI

The Indian Central Oilseeds Committee has decided to offer a prize of Rs. 5,000/- to any person or body who designs the best model of village ghani and demonstrates its working to the satisfaction of the Committee or a competent body appointed by it.

Details regarding the prize may by obtained from the Secretary, Indian Central Oilseeds Committee, Ministry of Food and Agriculture, Room No. 345. Block No. 9, Shajehan Road, New Delhi—2.

:RTILIZER USE FOR STEPPING UP CE PRODUCTION

Dr. M. V. VACHHANI, Central Rice Research Institute, Cuttack-4. Orissa

:CE is the most important single crop in India ccuping about 1/3rd of the total area under food rops and forms the staple food of the majority of opulation. With an annual area of about 73 acres, India is the largest grower of rice in the but the production is not proportionately high the low acre yield, the average being about 800 lb. 1 rice per acre as compared to 2,300 lb. in Japan. f the causes of such low yields is the low soil 7. The rice soils in India are particularly tt in available nitrogen and the organic matter. ore, the quickest way to step up the rice produc- to increase the productivity of the land by the us application of fertilizers and manures.

PROBLEMS OF RICE MANURING

llowing an extensive series of manurial trials it n found that almost invariably the rice crop gives 'ease in yield with the application of nitrogen in orm or the other. However, this increase has from ten per cent to almost cent per cent. This on is due to differences in the nature and the 'ertility of the soil but the more important is due dose, method and time of application. Efficient r use can result only when the nutrient element to its fullest by the plant. Therefore, a careful ration has to be given to the choice of fertilizer, se and the time and method of its application. not, of course, have all the facts. That is why we ontinue our fertilizer research on the crop. Some important findings which can be immediately d are briefly discussed hereunder.

CE OF THE FERTILIZER

large number of experiments has been conducted ipare the efficiency of various nitrogenous fertili- pplied on equal nitrogen basis. It has been found ammonium sulphate is the most satisfactory er for the rice crop. It is a chemical fertilizer ontains about 20 per cent nitrogen. It is readily e in water and the nitrogen becomes immediately ble to the plant and the effect of the fertilizer is otible within 3-4 days as the foliage gets deep

ROGEN NEED OF RICE CROP

Response of rice yields to nitrogen is very closely d to the initial fertility of the soil. But the results ite that on the soil of moderate fertility, the crop nds well to the application of about 100-200 pounds imonium sulphate. The dose beyond 200 lb. gives er response and in certain cases even decreases in s.

A moderate application of ammonium sulphate upto ... The maximum yield ... ium sulphate as against the check plot yield of 1,842 lb. giving an increase of 525 lb. per acre.

RATIONAL METHOD

The customary method of applying ammonium sulphate consists of spreading the fertilizer on the 'wet' soil surface after planting. Experimental results indicate that the application of ammonium sulphate in dry soil condition 2-3 in. deep immediately before letting in water for planting gives higher yield than the customary practice of broadcasting on the surface after planting. The fertilizer could be evenly applied in plough furrows which will be covered up by cutting the next furrow. The trials conducted on the cultivators' fields during 1951-52 have shown that the dry application of ammonium sulphate at 100 lb. per acre gives increased yield of 466 lb.of paddy per acre as compared to 304 lb. per acre in case of customary 'wet' application.

Where the fertilizer cannot be applied in dry soil condition it is desirable to make small egg size balls of ammonium sulphate mixed with earth in the proportion of 1:10 and thrust these balls 2-3 in. deep at the time of weeding.

The common practice of applying the entire quantity of ammonium sulphate immediately after transplanting is less efficient than the application of entire quantity one month after transplanting or in two equal doses, one at planting and another one month after transplanting.

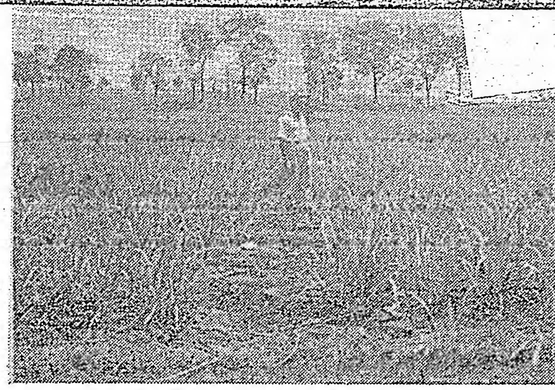
CULTIVATOR'S PROFITS

What does the increase in yield due to the ammonium sulphate application mean from the economic standpoint or money ? Though an increase in yield of 500-600 lb. per acre has frequently been obtained, the extensive trials conducted at 60 locations on cultivators' fields in Orissa with an application of 100 lb. of ammonium sulphate per acre gave an overall average increase of 275 lb. of paddy per acre over a no-manure control plot yield of 1,521 lb. per acre thus giving an increase of about 18 per cent. The calculation of profit on this basis is given below:—

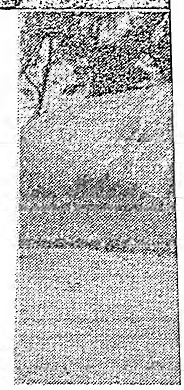
Cost of 100 lb. of ammonium sulphate	Rs. 16-4-8	At the rate of Rs. 36-8-0 per bag of 2 cwts.
Price of increased paddy of 275 lb.	Rs. 23-14-1	At the local prevailing rate of Rs. 7-2-0 per maund.
Net profit per acre due to fertilizer application.	Rs. 7-9-5.	

Thus a net profit of Rs. 7-9-5 per acre accrues to the cultivator by applying 100 lb. of ammonium sulphate per acre besides making more rice available to the country. Also there is an increase of 8-10 maunds per acre in straw yield due to the ammonium sulphate application which has not been taken into consideration.

Uplifted Canal and Drainage Ditch—*Whereby water is circulated from pipelines and storage well*



First-Ratoon Crop—*in its second month*



Hay Stacks
foundation of
poles for pro

draining off the land, leaving his crops to wither in frequent drought periods. So he decided to do something about circulating the water. First he built three storage wells fed by drainage ditches. Then he installed electric pumps adjacent to them to send the water back to the fields again through pipes leading to the uplifted canals. "In this way," his son explained, "the water is used over and over again. And its duty has been raised by fifty per cent. Silt from the drainage ditches," he added, "is used as a fertilizer."

I inquired about his father's tile-drainage system which I'd been told was the only one in Mysore State. "To correct the alkaline condition of the soil," Narasimha Iyengar explained, "my father laid down a series of porous pipes from 3 to 4 feet beneath the surface. They are spaced 80 to 100 feet apart with outlets into another series of drainage ditches. In this way, harmful alkalies drain off the soil, leaving it healthier and more fertile."

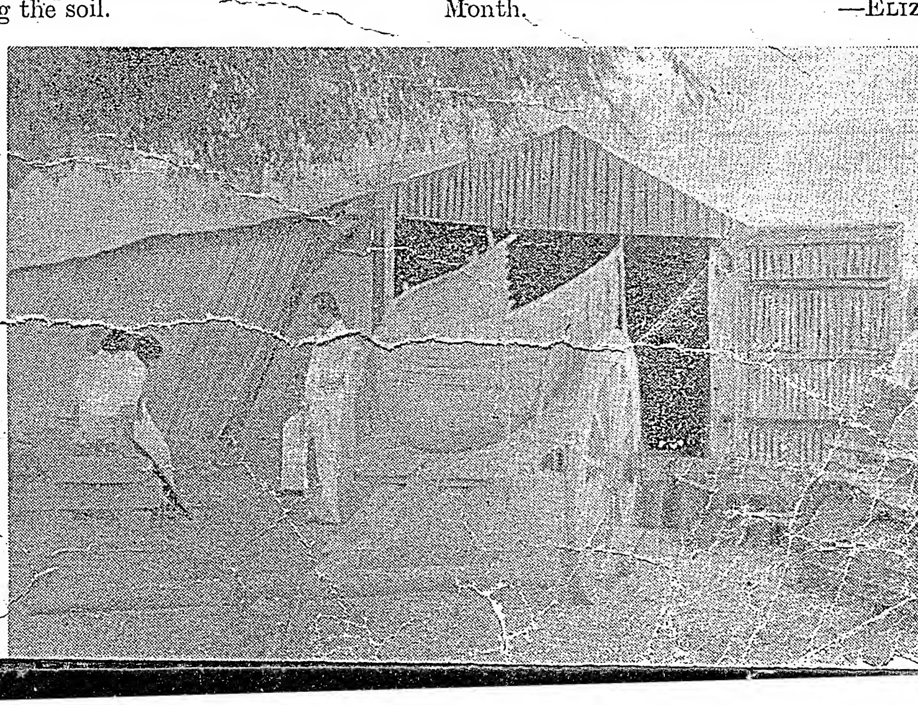
On the way back from the sugarcane area we passed fallow fields used for dry crops—*ragi* and fodder which are planted in July and harvested in November. Narasimha Iyengar explained that preparation of the soil for these dry crops takes place between May and June. Two pairs of oxen are required and animal manure is used as a fertilizer. After harvest, the stubble is burned and then plowed up after the first rain to aid in fertilizing the soil.

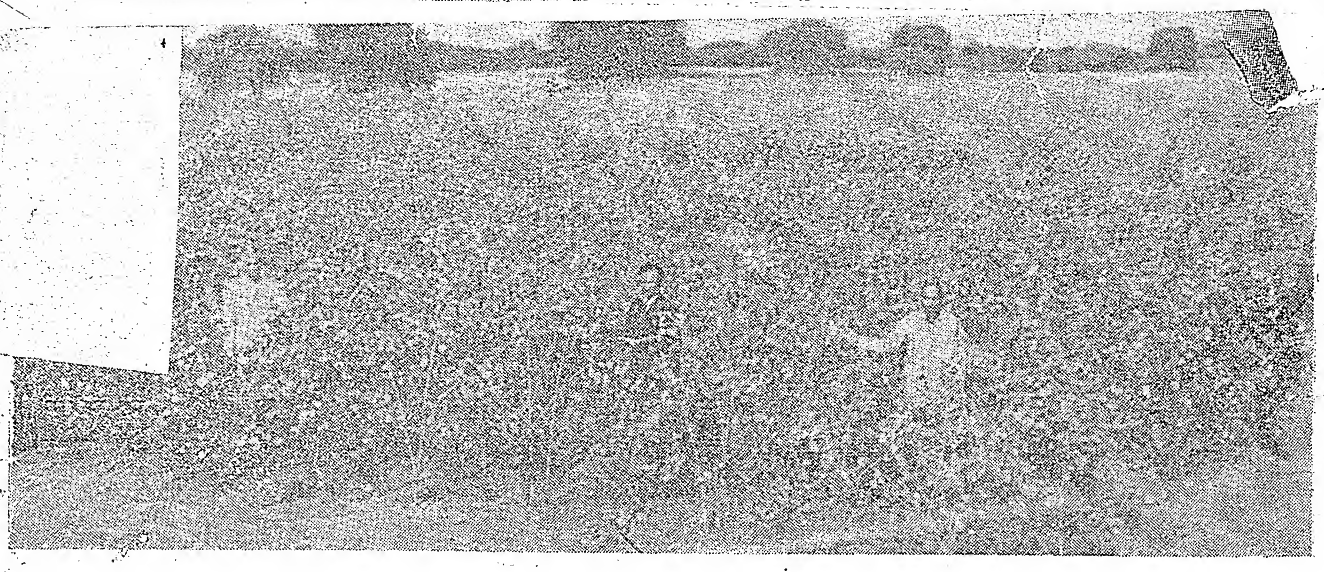
By this time it was nearing midda
Iyengar presented us with refreshing
ripe coconuts before displaying his mec
ment. The first item he showed us w
Giant" threshing machine purchased fro
States in 1908 for $650! He is still usi
ragi but today it is powered by a new
Diesel tractor also purchased from the
Narasimha Iyengar demonstrated a
plow attachment in a nearby field, his fa
that he needs a mechanical seed drill a
drawn manure attachment to help him
constant experiments with the land.

This 83-year old farmer firmly beli
future of Indian agriculture rests upon
of farm implements, the use of better
more and better fertilizers, and, above
gent, progressive management of la
"For every Indian farmer, whether he
or 1,000, farming should be a full-time

On the way back to Bangalore, I re
companions that the venerable far
practices what he preaches. For his
Iyengar has devoted almost every waki
the past 57 years to the improvement
And he is still working at it with the help
son. By this time I was thoroughly c
Krishna Iyengar had earned the title of
Month. —Eliz.

The Old and the New—*A bullock plow stands idle next to the Iyengar's new tractor*





SOME PRACTICAL HINTS TO FARMERS TO INCREASE PRODUCTION OF *COTTON*

By J. J. CHANDNANI, M.Sc. (Agri), Division of Agronomy, Indian Agricultural Research Institute, New Delhi.

Cotton is an important crop in the economy of the country. The supply of raw material of cotton is much short of the requirement. It is therefore imperative to increase the production of this crop. Some hints on how to increase production of cotton are given below :—

Preparatory tillage : Before sowing cotton, the land should be cultivated thoroughly to prepare a good seed bed. The use of improved implements helps you to reduce the cost of cultivation and keep down weeds. Bunds of the fields should be properly raised so that rain water or irrigation water can be more efficiently utilized. The land should be properly levelled with *desi* levellers. The levelling of fields is necessary as cotton plant is very sensitive both to stagnation of water and drought. The good cultivation and preparation is the essence of success of cotton growing.

Sowing : Where irrigation facilities exist, land should be irrigated twice before sowing and land prepared when comes under condition. The seed should be sown immediately after the land is prepared in lines. The line sowing though involves more labour is to be preferred to broadcast as it helps to reduce the cost of interculture. Optimum seed rate is 20 lbs. per acre. Seed should be soaked in water in the previous night and rubbed with cow dung or soil the next day before sowing. These precautions will help you to get good stand of the crop. Where crop is to be sown with monsoon the land should be prepared after the first shower and seed sown in lines as above. The distance between the lines and plant to plant in a row varies with the variety and time of sowing. With *desi* varieties, the distance between ... about 1.0 ft. These distances should be reduced to an advantage when late sowings are done.

Optimum time of sowing : The time of sowing varies in different States in the Union. Optimum time in some of the States is as under :

E. Punjab, PEPSU, Western Uttar Pradesh, Rajasthan, Delhi	The optimum period lies in April and May.		
Madhya Pradesh, Madhya Bharat, & Hyderabad Deccan	In this area cotton is generally sown with rains. The optimum period for rained cotton is June. Where irrigation facilities exist for sowing, cotton should be sown in May.		
Bombay including Saurashtra & Karnatak	*South Gujrat*	June	
	Middle Gujrat	June	
	North Gujrat & Saurashtra	Mid June to mid July	
	Khandesh	June	
	Karnatak	August—early Sept.	
Mysore		*Irrigated*	*Rainfed*
	Upland Cotton	Feb-March	May-June
	Egyptian Cotton	October.	
Madras	Cambodia & Egyptian	Sept.	
	Others	June	

It is very necessary to sow cotton in the optimum period. An increased yield of the order of ...

remain on the land. The other four are engaged in business and professional work.

Narasimha Iyengar told us that his father now has from 30 to 40 acres under sugarcane—his cash crop which he manufactures into jaggery for the local market. The yield per acre he calculated as averaging 40 tons of cane, or 400 maunds of jaggery which sells for Rs. 4-5 per maund. The Iyengars have kept 10 to 15 acres under paddy for their own needs and for those of the Uraghalli villagers. Any surplus paddy goes to the Department of Agriculture for seeds. From 80 to 100 acres they devote to *ragi*, also for internal needs. And the rest of the land is given over to fodder for their 200 head of Hallikar cattle which they raise for manure. They also breed bulls for buyers in Mysore and Bombay.

When Krishna Iyengar returned from the fields, he told us how the 200 acres of farmland came into his family's possession in 1881 in payment for money loaned to the royal family. It was then mostly under paddy and no one took much interest in it until Krishna Iyengar matriculated from Central College at Bangalore. The venerable farmer recalled how he'd studied physics and botany at college.

"I learned all about matter and energy and fruits and flowers," he said. "And then I got restless after college and couldn't settle down to any particular *business*. So I took to the soil and the science of farming." And so began more than 50 years of successful experiment with the land.

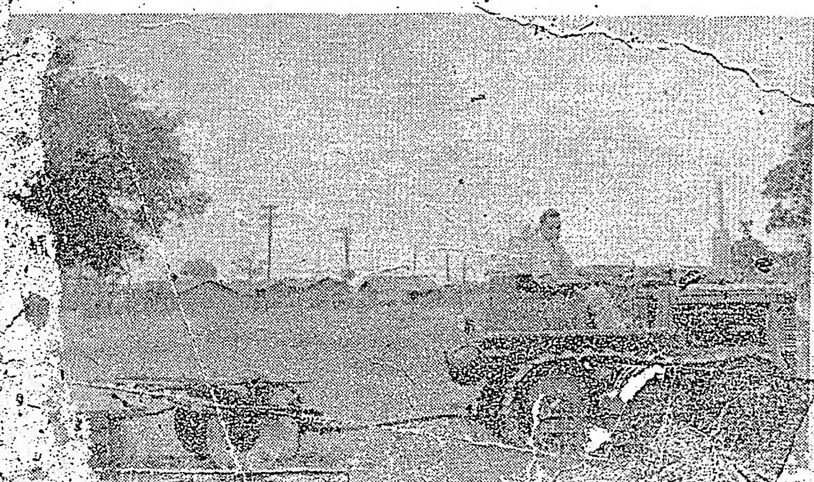
On the way to the scene of his various land projects, Krishna Iyengar revealed many details of his intelligent management of the land and its resources. It was obvious from all that he said and from all that we later saw, that for the Iyengars, both father and son, farming is a full-time job—one to which all their energies are devoted.

"To save money and labour I use the ratoon method of raising sugarcane," he explained. "For seed I use CO 419, a drought-resistant variety from Coimbatore which ratoons well for three successive

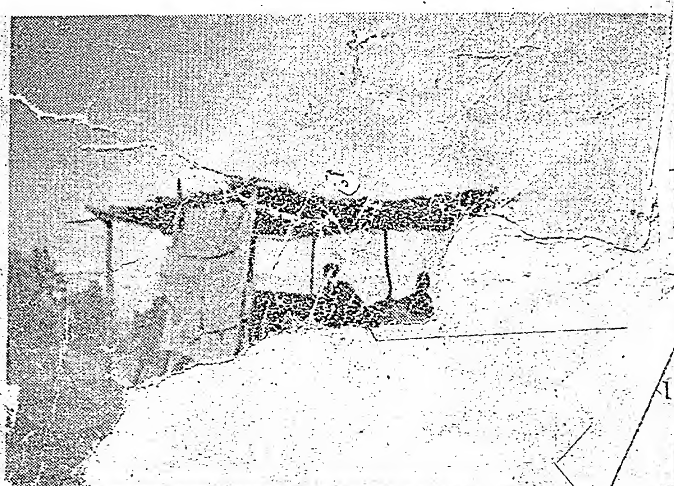
IRRIGATION S[illegible]—*Storage well and electric pump* [illegible] *water back to the fi*[illegible]

HIS SON NARASIMHA IYENGAR—*examining the second ratoo*[illegible] *sugarcane crop in its eighth month*

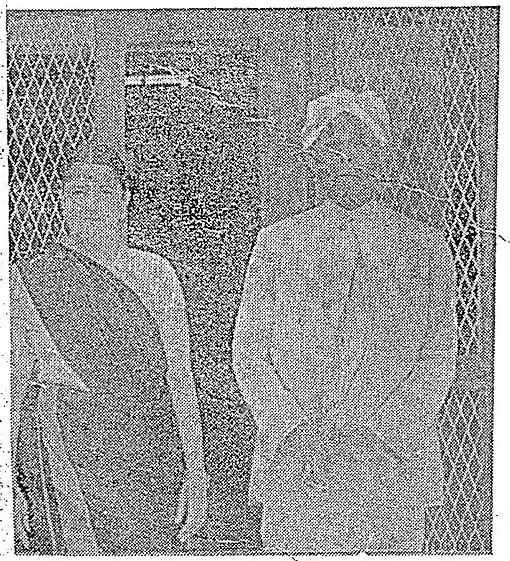
INTERNATIONAL DIESEL TRACTOR—*its plow attachment demonstrated by Narasimha Iyengar*



MECHANIZED THRESHING—1908 "*Little Giant*" *threshin*[illegible] *machine powered by 1948 diesel tractor*



only about five tons of cane per acre. variety was supposed to be susceptible it called mosaic. And it was prohibited Government. However, I promised op if any mosaic appeared. And I also distribute the seed in question among farmers. That was ten years ago," and the fungus disease hasn't appeared n getting from 35 to 40 tons per acre!" rishna Iyengar if other farmers in the ted from his experiments with sugarcane n answer he summed up his pragmatic the following observation. "Money-ds attract all farmers. If they see a ing money with improved seed varieties, rs, and new methods of cultivation, te him." My next question was about rtilizing the soil.



MILY—*From left to right, N. K. Narasimha who farms the land with him, Kamalammal, ages the household and the grain-storage bin as and N. Krishna Iyengar himself*

) weights of superphosphate per acre planting, in January or February. later I add from 4-500 weights of osphate. And three months after y from one to one-and-a-half tons of

your net profit per acre," I inquired. oughly that it costs him Rs. 1,450 for ertilizer and jaggery-production. Rs. 2,000 for a net profit of

N. K. Narasimha Iyengar *is examining his sugarcane crop*

"The cane matures in the eleventh month," he continued. "Then it is harvested and crushed in this small power mill which I purchased from a Glasgow firm in 1905." Still in active service 47 years later, we examined the power mill which has had its rollers replaced only twice. Krishna Iyengar told us it crushes cane at the rate of one ton an hour. The juice is collected in a large pan and then pumped into an overhead storage tank until jaggery-production takes place in an adjoining boiling shed. Bagasse, or crushed cane, is used for fuel in making the jaggery.

In the boiling shed Krishna Iyengar showed us how the juice is limed and then transferred to a huge boiling pan where the molasses is separated and scrapped. After passing through a syrup stage it finally settles and cools in wooden moulds which form cubes of jaggery. Krishna Iyengar estimates that it took him 30 years to arrive at his present standard of jaggery-making. "I solved each problem as it came along. And I was constantly on the lookout for ways to improve the process." He then mentioned one of his recent visitors—a farmer from Hyderabad who had heard about his method of producing jaggery and who came to study it.

Going back over the years, Krishna Iyengar recalled how the American agricultural chemist, Dr. Lehman, came to India early in the century and conducted some of his experiments at Uraghalli. Together, the two men studied the chemical behaviour of sugar from month to month. And in 1910 Krishna Iyengar persuaded the Glasgow firm to build machinery for a small sugar factory which he planned to set up in Mysore State. However, he exhibited this equipment first at Allahabad. And it was eventually purchased by the Maharaja of Rewar who established it up north as the first sugar factory of its kind in India.

While Krishna Iyengar rested under a tamarind tree, his son took us on a tour of the cane fields and also showed us his father's unique irrigation system which he worked out more than 40 years ago in 1905. The same system was put into operation five years later at a Government Agricultural College then located at Hebal five miles from Bangalore.

INC

By J.

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pests but also high yielding. Many long staple varieties (7/8″-1″) have now been evolved and found to grow satisfactorily in the country. As the demand of long staple cotton is very great in the country, it would be advisable if the cultivation of these varieties is encouraged. These varieties in addition to good yield, fetch much higher price in the market. Some of the recommended and promising varieties are given below:

E. Punjab & PEPSU L. S. S., F-216 & F-320 (P-American) M-60A and 231-R (Desi)

Delhi and Rajasthan F-216, F-320 and M4.

W. Uttar Pradesh Perso American C520, 35/1 C-100 (American) Desi

Bombay:
- Broach Tract Vijaya
- Waged Tract Kalyan
- Khandesh Tract Jarila, 197-3.
- Surat Suyog & 1027 A.L.F.
- Kurpta Dhawan, Laxmi, Gadak No. 1 and Jayawant.

Madras:
- *Combodia Tract* Co2, Co3, Co4, No. 920, No. 4463, & MU I.
- *Tinnies Tract* Karungami Strain No. 2 and 5.
- *Northern Tract* N-14
- *Western Tract* H-1.
- *Cocanda Tract* G-1 or Cocanda 1.
- *Mungari Tract* 881F.

Hyderabad Deccan:
- *Nanded District* Gaorani 6, Gadrani 6E-3.
- *Raichur District* Jayawant, Raichur-Kunpta 19.
- *Osmanabad* Gaorani 12.
- Bidar district

Madhya Pradesh:
- Nimar District excepting Khaknar Circle: —O—-91 H420 Akola, Nagpur district.
- Khaknar Circle, Morsi } Buri 107, 0394
- Yeotmal District V434, H420, 091
- Amraoti district Buri 107, Indore 1, 0394,
- Wardha H420 & 0-91.
- Buldana District Jarilla.

Madhya Bharat:
- Malvi 9, 10, 12
- Indore 1, Buri 107, Parbhari American 1,
- Indore No. 2, Jarilla.

Mysore:
- Shimoga, Chicmagalur, MAV
- Hasan & Mysore districts
- Northerns & Chitaldrug Sa-60 districts.

Note: Variety F-216 from Punjab has been grown successfully in the Madras. It is likely that F-216, F-320 and M-4 are likely to be success in Bombay, Hyderabad-Deccan, Madhya Pradesh, Madhya Bharat and Madras. These varieties are early and picking would be completed by December. Some of these can stand drought conditions to a certain degree. Please get a little seed and test for yourself on a very small costs you nothing, but it is your great asset in increasing your production. Make it a point to grow always improved varieties.

Irrigation & after care: Interculturing and weeding is of great importance in the growth of cotton plant. The importance of interculturing cannot be emphasised in rainfed areas. The sowing of crops in lines would now enable you to do this operation quickly and cheaply. The cultivator should at least give two intercultures if not more. In addition to intercultures in between the rows, it is also necessary to remove weeds growing in between plants in a row. The first irrigation to cotton after sowing should be given after 4 to 5 weeks depending on the climate and subsequently irrigations at the interval of 15-20 days till flowering. During flowering and boll formation, interval may be reduced to 10-12 days. The interval between two irrigation can be increased again to 15 to 20 days in the later stages of growth. It is not necessary to irrigate cotton after Mid October. Flowering and boll formation period is the most critical stage in cotton growth. Too much and too little irrigation and rains at this stage are not good. Both these affect yield adversely. It is necessary to be very careful about irrigation of cotton at this stage.

Where irrigation facilities do not exist, it is very important to study the rainfall trend in any given locality and select variety accordingly to fit in with the rainfall of the tract. Misfit of variety in a tract is often a cause of failure of a crop. Be careful to study your rainfall or irrigation conditions and select variety accordingly.

Manuring & Rotation: Cotton is a crop which responds to manuring. The most dominant requirement under Indian condition is the application of nitrogen. The manuring of cotton is also subjected to the rotation followed in growing of cotton. The most economic rotation for cotton is one, in which cotton follows legume e.g. Methra, Senji, Peas, Gram or Berseem. In such a rotation doze of nitrogen to the growing crop of cotton can also be reduced.

The other common rotation is one in which cotton follows rabi fallow. The fallow cultivation enables cultivator to reduce his cost of manuring. In irrigated areas, cotton also follows rabi cereals, i.e. wheat. In such a rotation, not only cultivation is not properly attended to but also cost of manuring is high if yields as good as in the two rotations are expected or else yields are reduced.

You are therefore advised to sow cotton after a legume preferably or else after fallow. The manuring practises recommended for different states are given below:

It has already been stated that nitrogen is the dominant requirement of cotton. Nitrogen can be applied as sulphate of ammonia, a cake, alone or in combination.

Bomb[illegible]

1. Ca[illegible] 400-600 lbs. per acre
2. Cake [illegible] to 200 lbs. plus sulphate of per acre. am[illegible] 00 lbs.

The mixture should [illegible]onia be supplied in two equal dozes one at the time [illegible]ing and other about 8 weeks later.

Field Rat

ield Rats and heir Control n the Punjab

By

K. N. TREHAN, Entomologist, Punjab, Government Agricultural College, Ludhiana.

RATS are the most serious pests since they spread plague as well as destroy large amounts of h... food. Besides being carriers of di... ...ey kill poultry, and destroy egg. The ...al... ...ction of human food alone is a sufficient e... controlling or eliminate them. ...ront per...

Under the present ...t it... food shortage, conservation of food-st... presents a serious problem in India and if whatever is produced is to be made available ... e preserved properly ... f insects and rodent ...

... both of which are ... field rats live both ... and make extensive

The mole rat on the other hand, is known as the 'blind rat' and its burrows are usually noticed near the bunds or the water channels. At each entrance a mound of earth big enough to be noticed is found. Its burrows run horizontally, winding among the parts of plants situated in the soil in a zigzag manner and may run from 30 to 40 feet with many branches ramifying throughout the field.

Both these species are destructive to all the important crops ... ...eat, gram, ground nut, maize, sugarcane, cotton and vegeta... ... trees. Wherever they find suitable food, they at once migrate thither in large numbers and establish themselves so firmly that it becomes difficult to eradicate them.

Rats always abound where food and shelter are available. They are mostly nocturnal in habit but are also active during sunny days when they move out in search of food. The field rats start breeding when about three months old. Normally the gestation period is 21 days and each female may produce 6 to 7 litters a year. They grow rapidly and are weaned when three weeks old. Rats are prolific breeders. On an average the life of a field rat is about three years.

The statisticians and the biologists may disagree with regard to the degree of damage by rats but they all are convinced that these tiny creatures are responsible

for tremendous losses both in the fields and in the store. The Government Entomologist of prepartitioned Punjab estimated in 1921 that a rat, on an average, consumed about one chhatak of grains per day worked out an annual loss of about 91,25,000 maunds of foodstuff in the province caused by rats.

In the fields, their damage starts as soon as the crops such as wheat, gram, maize, cotton and groundnut are sown. In heavily infested areas, particularly of 'bet' land, most of the seed sown is eaten up and some times second and third sowings are needed. Besides, they also harm the seedlings and even damage and destroy the grains, pods and bolls, etc., when the crops are ready for harvest and also enter the godowns to damage the stores.

In rainfed ares in the Punjab although the damage is noticed practically in all the fields, but even if half the area under crops is taken as infested and reduction in yield assumed to be 3/4 maunds per acre brought about by rats the loss will amount to round about 44,56,687 maunds. On this basis the estimated annual loss to the Punjab State may work out to be about 44,56,687 maunds of foodgrains worth more than five crores of rupees.

The loss is further supplemented by their eating indiscriminately other foodstuffs, stored fruits, vegetables and tubers and nibbling wood-work of buildings on the farms, etc., etc. In gardens, they cut the roots of trees and cause them to dry up. They are also great enemies of poultry.

Inside the human dwellings, they destroy all kinds of food, make extensive burrows, spoil furniture and destroy the wearing apparels, blankets, quilts and even the military kits in the camps.

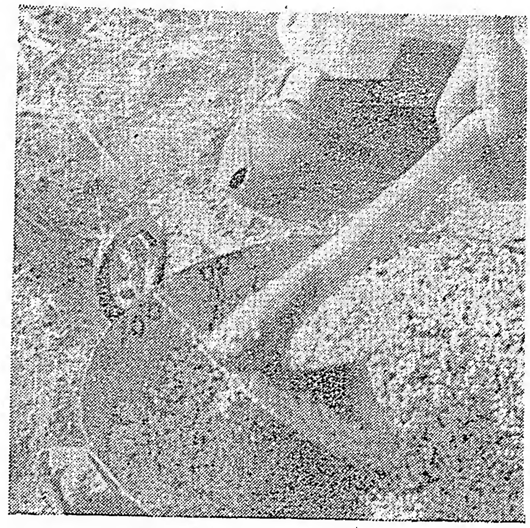
In spite of heavy losses by rats their control has unfortunately received little attention. The exclusion of rats from godowns, residential and farm buildings, cattle and poultry sheds, etc., can be effected through proper rat-proofing of buildings but poisoning, gasing and trapping also may yield temporary relief. Poisoning and gasing can only be successfully employed, provided these operations are adopted on a community basis.

In the fields, however, rats are the most serious problem with which the cultivators are confronted. Although the damage by field rats has always been considerable, yet concerted efforts to check this menace were not made on an extensive scale till recently.

During the year 1949-50, however, this problem was taken up by the Department of Agriculture, Punjab very seriously and a definite campaign was organised for the destruction of this pest.

Rats are destroyed in various ways, the common ones being (*a*) Beating, (*b*) Trapping, (*c*) Baiting, and (*d*) Fumigation. The first two methods are very commonly used in houses but the third and fourth methods are of particular importance in the fields. Of these, fumigation was considered to be a very laborious method, and the baiting as the most effective, economical and easy.

For baiting, preliminary field trials were conducted with various poisons but strychnine hydrochloride and zinc phosphide yielded extremely satisfactory results. Thereafter, both these poisons were tried extensively and large areas were treated in different districts of the State.



Preparation of the bait

Baiting a burrow

A dead rat at the mouth of the burr

The following baits have been used at different places and have given extremely satisfactory results:

(1) *Strychnine hydrochloride bait*

Strychnine hydrochloride ..	½ Chhatak
'Gur'	2½ seers
Gram 'dal'	20 seers
Water	About one seer

Soak 'dal' in water over-night or cook it for about fifteen minutes over fire and strain it. Make a thick syrup of gur, add the poison to it and mix well. Put the soaked 'dal' in the poisoned syrup and boil the mixture and stir well so as to ensure a uniform mixing of the poison. The mixture is then removed from the fire and the bait allowed to cool.

(2) *Zinc phosphide bait*

Zinc phosphide ..	1 seer
Wheat flour ..	20 seers
'Gur' ..	2½ seers
Water ..	To knead it well.

Mix the poison with the flour and add to syrup. Knead it well and prepare small pills of the size of peagrains.

At first the area is surveyed and all the burrows are closed in the evening. Next day the burrows which are found open should be treated. If Strychnine bait is used, about a *'tola'* of the poisoned gram-bait should be kept near the opening of the burrows. The rat when comes out, finds the food within its reach and at once eats it. The death is almost instantaneous. In the treated areas, the dead rats are found soon after the application of the bait and can be collected in large numbers in about 24 hours.

While using the zinc phosphide bait, at least one pill should be inserted in each burrow which should be closed afterwards. The rats die within the burrows but the burrows which are found reopened should be treated again.

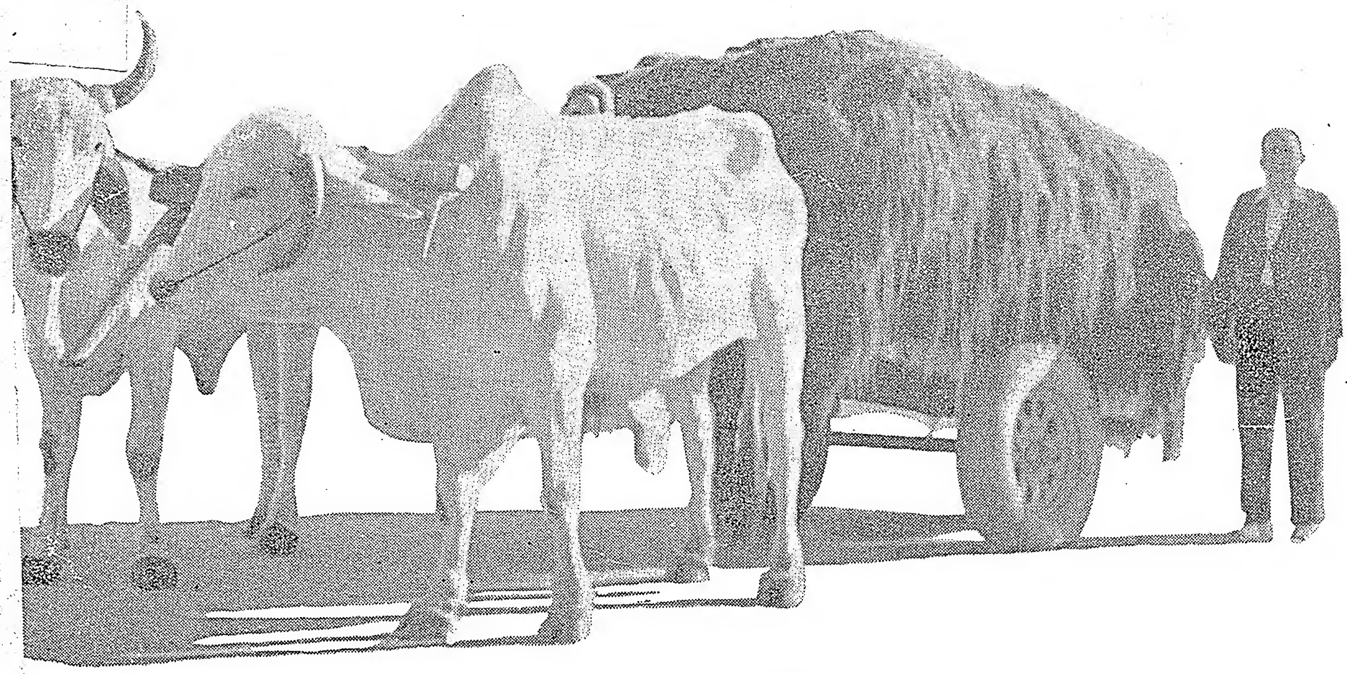
During the year 1949-50, and 1950-51 when extensive areas were baited in the State, the cost of baiting including poison, carriers and preparation charges, approximately came to 6 pies per acre both with strychnine hydrochloride and zinc phosphide baits.

The cost of baiting is very much reduced if the burrows are closed prior to baiting and only reopened burrows are treated.

Before distributing the bait to the zamindars they are cautioned strictly about the virulent toxicity and rapid action of these poisons. The unused bait, therefore, is collected from the cultivators immediately after the baiting operation is over.

Extensive areas of cultivated and uncultivated land in the Punjab State were baited with the baits stated above. For this purpose, however, large-scale village to village campaigns were organised in all the districts. Approximately twenty lac acres were baited in the year 1949-50 and about the same acreage in 1950-51.

As this pest is extremely destructive and is met with both in cultivated and uncultivated fields, it was considered essential to help the cultivators in fighting this menace. As the breeding places of rats are mostly found in uncultivated and barren lands as well as in sand dunes, it was considered not desirable to ask any cultivator to pay for the poison to be used in such areas. It was, therefore, decided by the State Govern-



Silage is being carted from the pit for feeding

THE ROLE OF MOLASSES IN SILAGE MAKING

By. YASHPAL CHANDRA GUPTA
Agricultural Officer Government of India, Cattle-cum-Dairy Farm, KARNAL.

AGE is an important part of the feed of the milch erd. It bridges the period between March when reen oats, berseem are finished and May when green maize, *juar*, cowpeas are ready in May. lso of much help during the months of November ecember, when no green fodder is available in . With silage the cows get a bite of green food year round. Lucerne and other grasses cannot vn over larger areas to supplement green fodder.

here are two masonry silo towers, and a mason-pit, and many plain silo-pits at the farm. y silo tower has a capacity of 6,000 mds. (220 f chopped fodder, but the silo-pits are the main- the farm. These are singular rectangular pits t deep. The size may vary according to re-ent. On filling these pits the green maize or built up 4-5 feet above ground level and a tight g cover of mud-plaster put on top. After six the silage is ready for use in an excellent condi- Cattle are very fond of it.

ize makes the best silage *juar* (Sorghum) is eful and gives a larger yield per acre, but cattle and relish maize silage better. Silage can be out of grass and other green fodders which are le in plenty during the season.

ION FAILURE

he reason for common failure in preserving s and grasses as high quality silage was o the low carbohydrate and high protein ts of these plants, which prevented desirable ation. Low sugar content prevents quick tation and permits undesirable bacterial action . Such action decomposes the proteins, produc- id odour with putrid silage.

he addition of molasses and jaggery (unpurified umps) to the legumes and grasses as they are

The sugar in the molasses provides the nutrients necessary for the bacterial action, which produces, the desirable acidity for preservation. The lactic and acetic acid formed, preserve the legumes and grasses with very slight nutrient losses.

The following quantities of molasses should be added to each estimated ton of green material.

Grasses or cereals	per ton	40 pounds.
Mixed grasses or legumes	,,	60 pounds.
Alfalfa, Berseem and clover	,,	80 pounds.

The addition of extra molasses makes the material more palatable and increases the feed value at low cost. The molasses may be added by gravity, air pressure or pump. The most simple method calls for a drum, two valves and a short piece of hose or pipe leading to the ensilage cutter. The line should be one inch in size or larger. Enough molasses to treat each load, is poured into the drum. A pail or two of water may be added if necessary to speed up the flow, when the molasses is cool.

It is not necessary to apply the exact quantity of molasses called for by the above table. Some operators use more molasses than was needed for preservation. Molasses, which is available in abundance in our country is not fully utilized except for the manufacture of power alcohol. Even today a very large quantity is being wasted. There is no other way of utilizing this material. In the pure state we cannot feed to the cattle, but the most economical method of utilizing this material is through silage. There were times when huge quantities of molasses were drained into the rivers. With proper transport facilities this wastage of molasses could be minimised and utilized in the manner indicated above. When it is added to the green fodder, it not only makes the silage more palatable but adds to the feeding value at a lower cost.

In places where molasses could not be easily procured, spoiled *gur* or jaggery may be used. This gives the same result, but the only point for consideration is that of the cost.

CONVERSION OF SILAGE

It will be interesting for the readers to know as to how the fodder is preserved by ensiling. As soon as the green fodder is filled in a compact mass in a silo, the following changes take place during conversion of silage.

Living cells of the plants continue to respire fast and utilize all the oxygen present, and give out carbon-dioxide. Within a short time all the oxygen present in the mass is exhausted, and this checks the development of moulds, etc. as they cannot thrive well in the absence of oxygen. This condition is then favourable for growth of the acid forming bacteria, which multiply greatly in the silage. After a couple of days, one fourth teaspoonful silage juice sometimes contains about one hundred billion bacteria. These bacteria utilize the sugars of the green fodder, and convert them into organic acids, e.g. lactic, butyric and acetic acids. The formation of these acids is very important in ensiling which checks the fermentation of undesirable bacteria and thereby prevent the putrefactive processes.

When acidity in the silage reaches the maximum further production is stopped. By sealing the silo air tight, the silage can be preserved for a period extending upto 20 years. If the air starts entering the stuff putrefaction will start, as putrefactive bacteria will start developing.

Carbohydrates are the main food of the acid forming bacteria. Starch and pentosans may also be utilized. It is needless to say that the quantity of formation of acids depends on the sugar content of the green fodder, which are to be ensiled. Too much acid is also harmful. In good silage acid is found to contain 1 to 2.4 per cent of the total weight.

In addition to acids, certain alcohols such as amino, and butyl alcohols are also produced in ensiling which give the characteristic area to the silage.

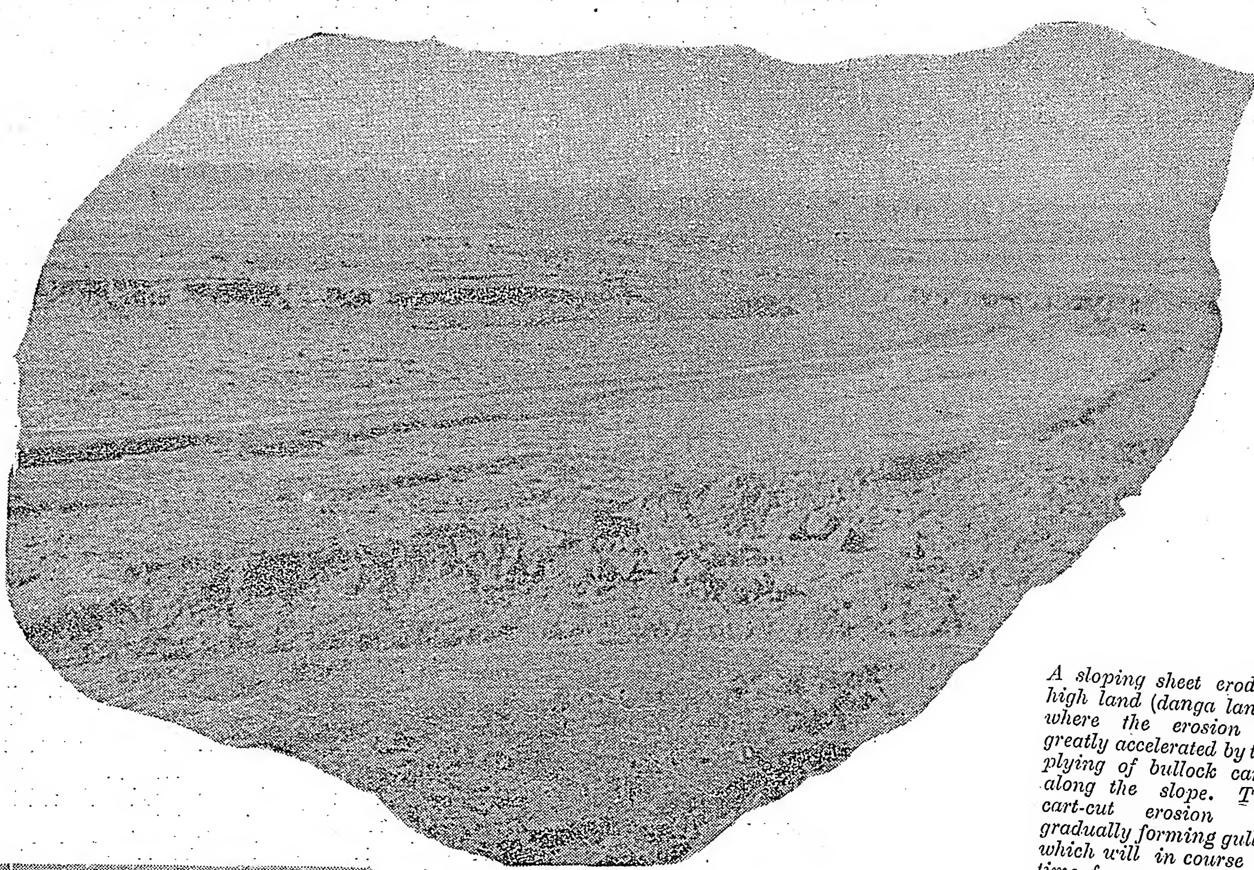
During the fermentation of the silage the temperature rises in the mass. If the mass is well compacted the temperature will not rise above 100° F, and this will give a fine yellow colour.

THREE SUPPLEMENTS

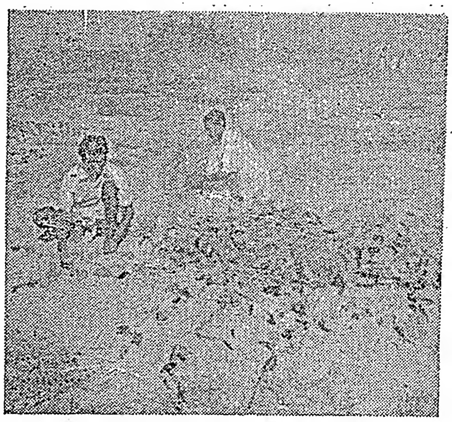
Grasses in general are deficient in carbohydrate. This deficiency of carbohydrates can be made up by the addition of *gur* solution, diluted molasses and cheap

(*Continued on page 26*)

Cart loaded with silage in the byre



A sloping sheet eroded high land (danga land) where the erosion is greatly accelerated by the plying of bullock carts along the slope. The cart-cut erosion is gradually forming gullis which will in course of time form a ravine



The long trailers of the tropical Kudzu (Pueraria Phaseoloides) the wonder plant which has controlled erosion very effectively throughout America are being spread on all sides and properly layered for controlling sheet erosion

THE VISWA BHARATI SOIL EROSION RESEARCH STATION, SHANTINIKETAN

A HUNDRED miles from Calcutta, at Shantiniketan, the famous abode of the late Shriyut Rabindranath Tagore is situated the above Research Station where experiments for checking the various types of erosion are in progress. This station was started in April 1944 with a view to working out comparatively easier and less methods of plantation in order to put a stop and also to reclaim the badly eroded area. It was also proposed to work out the run-off from various localities by laying out *randomised* plots and providing proper replication. The results have been encouraging and it is time that more public attention were focussed on this Station.

The total area of the Station is 196 acres of which 100 acres is Viswa Bharati land while the remaining 96 belongs to private individuals. The whole area is badly ravined and *murram* (coarse gravel) exposed. The whole of the gullied area has been ring bunded and plugging has been done by means of both brushwood and earthen bunds. There were a number of breaches during the first monsoon, but a chain of small spillways has minimised this to a considerable extent. The results have been remarkable. Silting behind these bunds has filled up the ravines to a great extent.

CAUSES OF EROSION

In some portions of the area gully formation has reached an advanced state of formation. This has been greatly accelerated by rill erosion caused by the bullock cart wheels. The result has been complete desolation. Murram has been exposed over the whole area and there is no top soil left any where. The ravines began extending in all directions and it was when a ravine actually began *eating* into the compound of the Poet's residence that the situation became really alarming. A bund was constructed all round the area in order to stop the rain water causing more damage.

The gullies were plugged with masonry structures and later the cheaper brushwood plugs were found to be equally effective. The soil began stabilising and after some subsoil was formed upstreams of these plugs the planting operations were started.

AFFORESTATION EXPERIMENTS

Cashew Nut (*Anacardium occidentale*) was the first tree planted and it took roots and got established. Later a large number of other varieties were tried. The following species of trees have been raised successfully—

(1) Dalbergia sisso .. Shisham
(2) Albizzia Lebbek .. Siris
(3) Butea frondosa .. Dhak
(4) Terminalia Arjuna Arjun
(5) Bassia Latifobia .. Mohwa
(6) Cassia Siamea ..
(7) Acacia moniliformia Wattle tree

The following were tried but failed to establish themselves.

(1) Shorea robusta .. Sal
(2) Palyalthee longifolia
(3) Tactona grandis .. Teak

A successful plantation of Shisham was established on some of the terraced slopes. Trees of *Acacia moniliformis* have also been successfully raised on similar ground. This tree has come into some prominence recently on account of its wattle bark and I understand that West Bengal Government are encouraging its introduction in the village wastes in order to make the State self supporting in wattle bark which was imported from South Africa.

GRASSES AND LEGUMES

Next in importance to afforestation is the introduction of grasses and legumes. The following grasses have been planted successfully on terraced slopes.

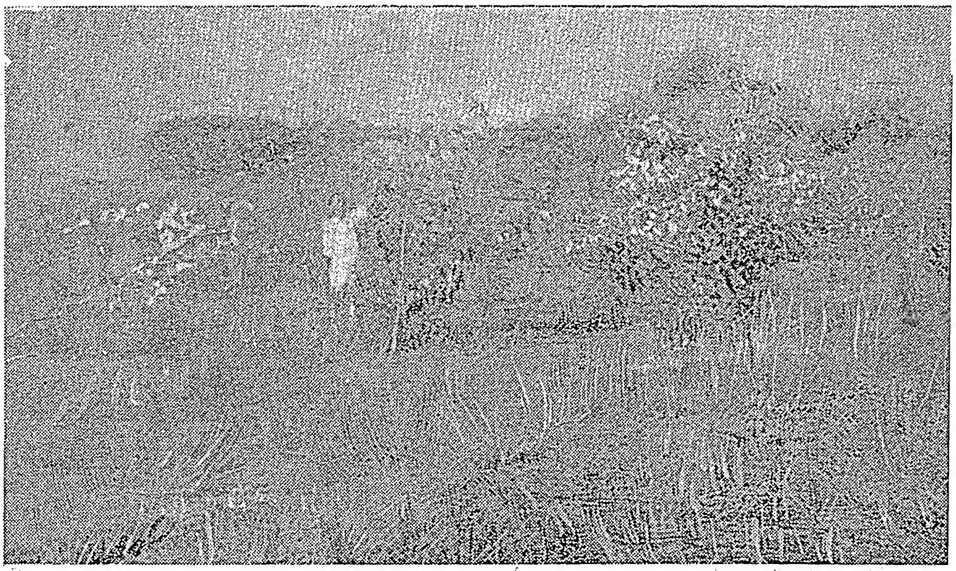
(1) Napier grass
(2) Lemon grass
(3) Love grass
(4) Sabai grass

The following legumes have been raised successfully.

(1) Turkestan Alfalfa
(2) Kudzu vine
(3) Lespedeza spp.

area is being stocked by layering the

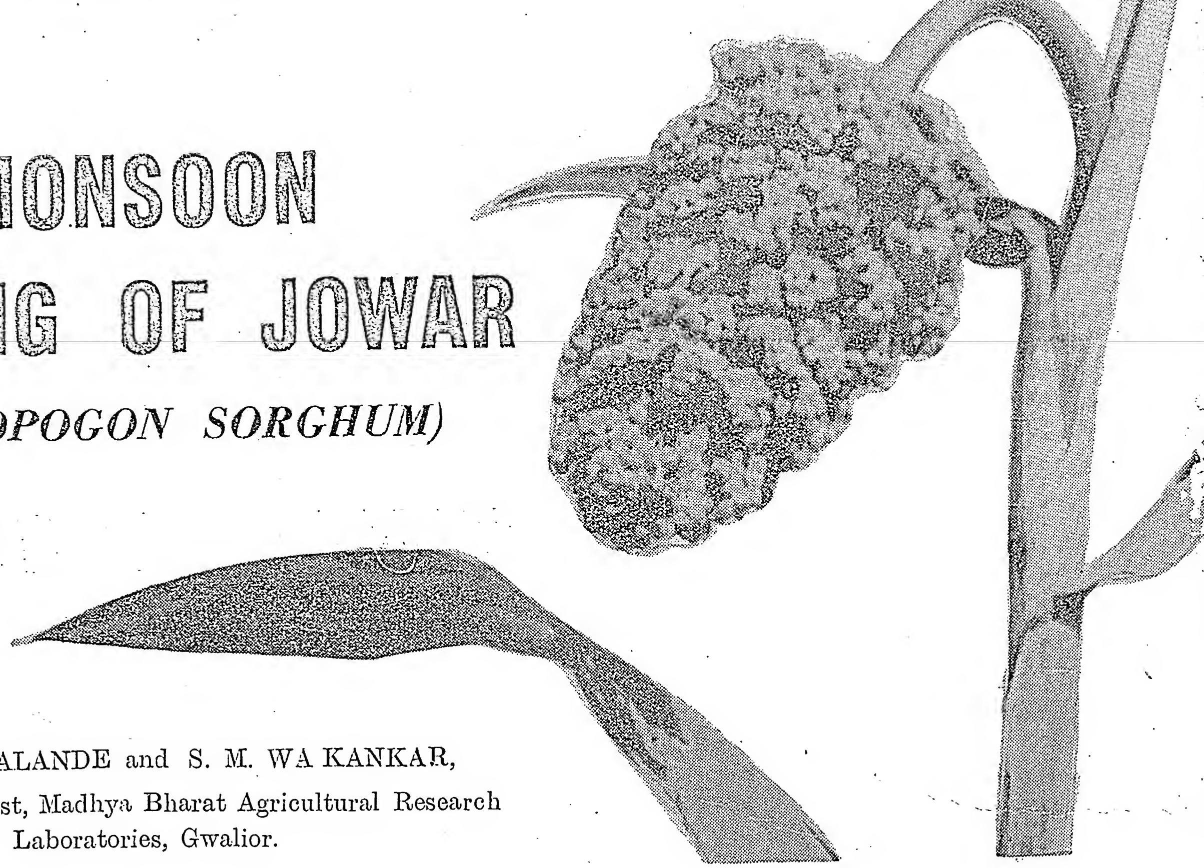
Shisham plants (Dalberjia sissod) growing well on the edge of the sloping sheet eroded land where the top soil is barely one foot in thickness. The plants are five years old at the time of taking the photograph



Wattle plants. (Acacia moniliformis) growing very well inside the state for stopping erosion the plants are three years old at time the of taking the photograph

PRE-MONSOON SOWING OF JOWAR

(ANDROPOGON SORGHUM)



By N. K. GALANDE and S. M. WA KANKAR,

Economic Botanist, Madhya Bharat Agricultural Research Laboratories, Gwalior.

BHILSA tract situated in central Madhya Bharat is predominantly a *rabi* area where wheat, gram and linseed crops are usually grown. Jowar is a minor crop there as it does not grow well. The soils are deep and heavy black in character. And rainfall is excessive during the monsoon.

There is a Government Farm at Bhilsa where *jowar* had been grown in the past but the yields were very low and discouraging.

To explore the possibilities of increasing the yield of *jowar* crop, an experiment was laid out wherein *jowar* variety Ujjain 6 was sown under (early) premonsoon and the usual monsoon conditions. Under premonsoon conditions, after harrowing the land with *Bakhar**, the seeds of *jowar* were sown by a two coultered seed drill in dry seedbed on June 29, 1951. The normal sowing of the crop was done after the break of monsoon on July 11, 1951. The seed in both the treatments was sown by two coultered seed-drills at the rate of eight pounds per acre. Manuring was done by applying ammonium sulphate at the rate of 100 lb. per acre drilled in with the seed and also by applying it as [illegible] one [illegible]

The experiment was laid out on 0.6 acre of land and plots of 0.1 acre were used for each treatment. The germination was satisfactory in all the plots and the stand was also uniform. One intercultivation with *Desi dora***, one hand weeding and another intercultivation at a later stage with *desi* plough were given to the crop. The rainfall was low this year and was favourable for the growth of *jowar* crop. The crop ripened in the last week of November and was harvested on December 1, 1951. The yield obtained under different treatments is given below :—

The above results clearly show that the yield of *jowar* is considerably increased by sowing the seed in dry seed-bed before the break of monsoon. The response of manuring is interesting as drilling ammonium sulphate with the seed increased the yield in both premonsoon and monsoon sowings where as ammonium sulphate applied as top dressing increased the yield appreciably in the premonsoon sowing but depressed it in the usual monsoon sowing.

The cost of Jowar seed is negligible as only 6-8 pounds of seed is required to plant one acre. Even though early sowing may be risky in certain years, the practice of premonsoon sowing deserves trial by Jowar growers.

Increase per cent .. 190.6	137.8	109.3	116.6
Manurial treatments	Yield of grain in maunds per acre		
	Premonsoon sowing June 29 1951.	Usual monsoon sowing July 11 1951.	
(1) No manure	15.4	7.4	
(2) 100 lb. ammonium sulphate per acre drilled with the seed	16.5	8.4	
(3) 100 lb. ammonium sulphate applied as top dressing one month after germination ..	18.4	5.[illegible]	
Average			

[illegible] structed [illegible] the area in order to stop [illegible] to a considerable extent. the rain water causing more damage.

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HIGH YIELDS IN SUGARCANE WITH THICK COIMBATORE CANES LIKE Co. 419

By K. R. REDDI,
Farm Manager, Sugarcane Research Station, Gudiyattam.

NORMALLY fifteen thousand three hundred sugarcane sets or forty-five thousand buds are planted in an acre. By utilising good seed material and by bestowing proper care at the time of planting, it is possible to obtain a population of at least thirty thousand plants per acre after the completion of germination. With careful after-cultivation and with adequate manuring and irrigation, these thirty thousand plants begin to tiller and multiply to a population of over a lakh of plants per acre after a period of three months. All these plants however do not develop into canes. Some of the plants die due to over-crowding, and some are lost due to insect attack. In many cane crops we often find only thirty to [illegible] thousand canes, when the crop is six or seven months old and the gaps in the rows are clearly noticed on examination.

These gaps are mainly caused by uneven germination of the buds planted and by the complete destruction of some of the sets by white ant attack. When care is taken to ensure uniform germination and when tillering and cane formation is encouraged by good hoeing, deep earthing up and adequate manuring, a good uniform stand of canes is secured in every row with no big gaps between plants.

The number of canes per acre in such crops where there are no gaps works out to over sixty thousand. All these sixty thousand canes can be kept on in good condition till harvest time, if the cane crops are well propped up to prevent lodging.

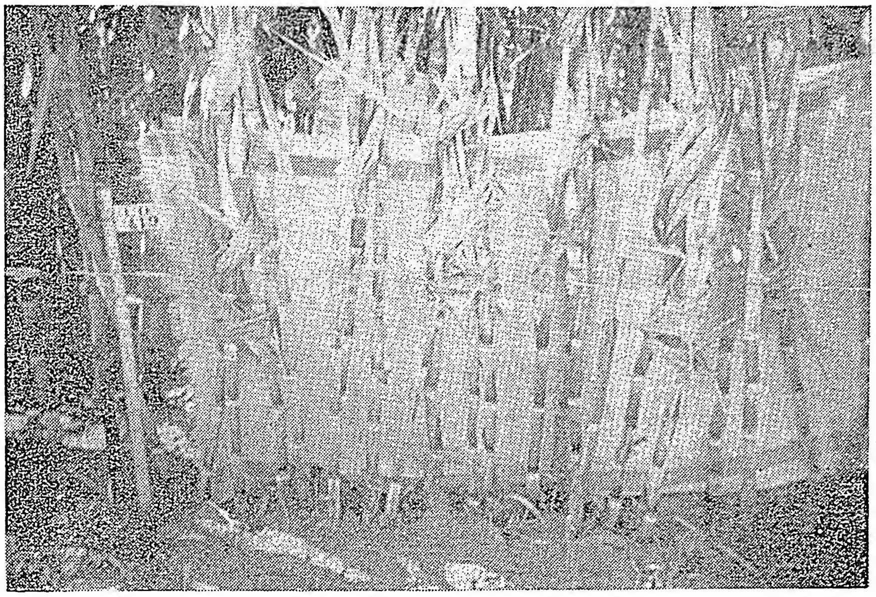
Cane of Co 419 weighing 4 lb. (7 ft. long and 3 centimeters in girth)

A cheap and efficient method of propping canes has already been developed at the Sugarcane Research Station, Gudiyattam (South India).

WEIGHT OF INDIVIDUAL CANES

A well grown cane of a medium thick cane variety like Co. 419 weighs about 4 lb. even when it is seven or eight feet in length and 3 c.m. in girth.

It is not uncommon to find canes growing to a length of 10 to 12 feet of millable cane in South India. Good growth of canes is often prevented in some of the crops due to profuse arrowing of canes which occurs even in the seventh or eighth month after planting.



Gaps in cane row lowers yield

Fortunately it is found that arrowing can be prevented by adequately manuring the crop at 200 to 250 lb. N per acre and by preventing excessive irrigation of the crop. If arrowing is prevented in the eighth month after planting, there will be no arrowing of canes afterwards and the canes will easily grow to a height of nine to ten feet of millable canes.

Besides length of the cane, girth of the cane is also very important to obtain good weight for individual canes. With adequate spacing of about three feet between rows of canes and with manuring at 200 lb. N per acre, it is found possible to obtain sufficiently thick canes weighing 4 lb. each. Planting in deepened trenches and deep earthing up are also found to promote good girth in canes.

It is seen from the above that with careful cultivation it is possible to produce about sixty thousand canes per acre, each cane weighing 4 lb. on average. At this rate the yield of cane per acre works out to one hundred tons per acre. Several intelligent cane growers have already obtained such high yields and others can attempt for them.

Without gaps better yields are assured

THE NATURAL METHOD OF HATCHING

By S. P. BERI, Poultry Development Officer, Animal Husbandry Department, Ajmer.

IN advanced countries like America thousands of farmers make a good living from poultry breeding, table egg production or hatcheries as these are specialised professions there. In India due to lack of properly organised marketing system and uncertainty due to epidemics and pests such results are not easily obtained. Thus it is generally advocated to keep poultry as a subsidiary source of income. In this way the diet of the family keeping fowls is improved and by selling some extra birds and eggs a source of supplementary income is obtained. Like the kitchen garden, poultry should be a regular hobby as an aid in the nation's Grow More Food Campaign.

One of the important duties of every poultry keeper is to hatch sufficient number of chicks every year to replace one half of his old birds. This is required to continue getting more eggs as younger females lay more than the older ones. The average economic life of a hen in India is about two and a half years. Moreover hatching has to be done to replace losses from mortality due to various causes. Hatching can either be done by the employment of broody hens (natural hatching) or by the incubators (artificial hatching). An incubator is only an imitation of the natural process in which heat is provided by artificial means and requiries the usual 21 days. Incubators are meant for hatching chicks on a large scale. Under Indian conditions natural hatching, still holds an important place and it has been observed that many poultry keepers neither know its proper technique nor is it explained in many books. For hatching winter months, i.e. from October to March are more suitable.

SIGNS OF BROODINESS

The ordinary *desi* hen is ideal for hatching. Broody hen can be recognised by the following main points :—

(*a*) Ceasing to lay eggs ;
(*b*) A tendency to sit undisturbed in a dark spot ;
(*c*) The feathers stand out when a person approaches or touches it ;
(*d*) A general lack of appetite and luster of the body;
(*e*) A reduction in the size of reproductive organs.

SELECTION OF A SITTING AND ITS MANAGEMENT

The purchaser of a broody hen from an outside source is dangerous as she may bring in disease which may spread in the rest of the stock. In case it has got to be purchased sometimes, special attention should be paid to procure the bird from a healthy flock.

Care should be taken that the hen is properly broody before setting the eggs. Occasionally the hen after sitting for sometime spoils the nest and smashes the eggs, which is a loss and great disappointment. To [illegible] to destroy lice is thoroughly dusting the whole feathery portion with few pinches of sodium flouride. Similar treatment with Gammexane in preference to sodium flouride has been found more effective but the manufacturers have cautioned against the use of higher dosages of the drug for poultry. The writer has not so far noticed the sequelae especially in the adult birds. It is a good practice to always dust the bird with one of the above insecticides prior to setting.

HATCHING EGGS

With improved breeds each setting egg should not be less than 2 ounces in weight. It should be of a good regular oval shape. Eggs of abnormal size or shape like too pointed, rugged or otherwise unsymmetrical do not usually give good results. Eggs with weak or cracked shells should be discarded. Under village conditions shell faults can be found by gently tapping two eggs together. The sound is duller in weak or cracked shells than in normal eggs. Dirty eggs should not be used for hatching. If a few soiled eggs which are quite good in shape, size and soundness of shell have got to be set under special circumstances, dirt should be cleaned with a knife and never by washing. Eight to twleve eggs is the covenient number to set under one hen depending upon its size.

The eggs should be stored in a cool and somewhat moist atmosphere. Fresh eggs should be used so far as possible. The length of period that setting eggs can be stored prior to setting depends mainly on atmospheric temperature. At hill stations and in winter months in plains, eggs can be stored for 7 to 10 days. In the hot weather under ordinary conditions of storage, eggs should not be stored for more than 3 to 4 days. The room where eggs are placed should be free from bad smell as that of onions, kerosene oil etc. The eggs should be stored with large end up before incubation.

PREPARATIONS OF NEST

Several different types of nests are made in different parts of the country. Generally wooden boxes of 14 to 18 inches square size with ventilation holes are recommended. It is undoubtedly convenient and very effective but once these wooden boxes are infested with ticks and other vermin, it is very difficult to make these absolutely free from them by ordinary means. The vermin go into the joints and crevices where the disinfectants cannot reach easily. In the experience of the writer a little less than half portion of a 'Pucka' earthen pitcher, (Ghara) which is used for drinking water in houses, of convenient size is a very cheap, easily [illegible]

Fertilisers And Manures— What Practical Agriculturists Think About It

By S. P. RAYCHAUDHURI,
Indian Agricultural Research Institute,
New Delhi.

AT the present day the most generally used fertilisers are ammonium sulphate and superphosphate while the manures are farmyard manure, compost, oil cakes and bone-meal. The responses due to the application of these fertilisers and manures as revealed by the excess of yield of the crop over that of the area which has not received the manure or fertiliser is usually obtained from the results of carefully conducted experiments at experimental stations and Government Farms. There is a feeling that these figures are generally biased and do not represent the responses obtainable in a cultivator's field. Hence it has been felt desirable to examine the actual yields obtained by practical agriculturists and compare them with figures obtained from the records of the experimental stations.

The Expert Committee on Fertilisers & Manures constituted by the Ministry of Food and Agriculture, on its tours to the several States interviewed some representative farmers in each place to gather from their experience information regarding the use and effects of fertilisers and manures.

DIFFERENT LEVELS OF RESPONSE

The effect of ammonia sulphate on crops in increasing the yields is generally appreciated by all agriculturists. The responses have been placed at different levels by agriculturists at different places, for example in West Bengal Shri S. C. Paul, placed it as high as 4.5 to 6 maunds paddy per maund of ammonium sulphate, though the State Agricultural Chemist placed it at 2 maunds per maund of ammonium sulphate. In Madhya Pradesh Shri Mundle stated that he gets on increase of 50% by using ammonium sulphate on his vegetables. But a most frequently expressed doubt was whether applying ammonium sulphate to food crops like paddy, etc. will leave a sufficient margin of profit. In West Bengal for example the return per maund of ammonium sulphate has been placed at 2 maunds per acre. The cost of one maund of ammonium sulphate there was Rs. 14-9 while the procurement price of 2 maunds of paddy was Rs. 15. This does not include the cost of transport, nor on the other hand does it include the cost of straw. But a profit of such low margin provides scant inducement to the agricul-

Very few of them could however give any positive instance where such effects had been observed.

BAD EFFECTS

From the information collected by the Agricultural Chemist, West Bengal, the bad effects attributed to the constant use of this fertiliser are: (1) it robs the natural fertility of the soil; (2) the soil becomes hard and acidic; (3) the crops require more irrigation; (4) the quality of the crop (sugarcane and potato) deteriorates. According to his note, in 18 localities bad effects were actually observed while in 6 localities there was a belief that such effects were caused by the continnous application of the fertiliser.

Shri S. P. Banerji of 24-Paraganas in West Bengal said that application of ammonium sulphate would result in decrease of yields after three years. But Shri B. C. Guha of the Nuddea Farm is using ammonium supphate for the past three years without any deleterious effect. Shri P. K. Barua of Assam has also used the fertiliser for 10 years without observing any such effects. Shri G. G. Shembekar of Sholapur had used ammonium sulphate on paddy (1 cwt. per acre) without any bad effect. Shri D. Devasthali (Mulgaon, Bombay) however was of the opinion that the land becomes harder due to the application of this fertiliser. Shri Jamdar of Nagpur thought that ammonium sulphate did no harm to the crop unless placed too near the roots, but he also gave an account of much loss caused to him by the application of ammonium sulphate to his orchard of oranges. However evidence is lacking to show that this loss he complained of was because of the application of the fertiliser and not due to any other cause.

The Director of Agriculture of Madhya Pradesh stated emphatically that so far as rice tract of Madhya Pradesh was concerned there was no well informed practical agriculturist who subscribed to the opinion that ammonium sulphate was harmful to crops or soils. On the other hand, he said, the agriculturists were so enthusiastic that they were willing to buy the fertiliser even at Re. 1 a seer.

The general impression gathered from the evidences is that application of ammonium sulphate singly and without proper irrigation is harmful to the crop. But if applied with proper irrigation or mixed with other

oil

supplied mixed with groundnut cake and super or bone-meal. The Uttar Pradesh Government has issued a circular that ammonium sulphate should be given to only such agriculturists who have purchased oil cake, so that it might be applied only after mixing with cakes. In Madhya Pradesh generally ammonium sulphate is applied with farmyard manure.

PHOSPHATIC FERTILISERS & MANURES

The most commonly used phosphatic fertilisers are bone-meal and superphosphate.

Superphosphate has limited demand because the response to its application is frequently not observable immediately. Further, broadcast application of the fertiliser has been shown by recent experiments to be of little value. In West Bengal and Assam super is very little used. In Bombay superphosphate is being distributed in fertiliser mixtures which is used for paddy and truck crops. According to Shri C. B. Samuel of the National Fertilisers, to meet the entire demand of the potato growing area round Poona about 25,000 tons of superphosphate are required.

In Madhya Pradesh, where response to superphosphate in the case of rice has been established by experiment, there is demand for super in the rice tracts. But in Uttar Pradesh there seems to be very little demand for this fertiliser.

Bone-meal is in general more popular, probably because it is a combined fertiliser (N. & P). In Burdwan districts, in Kashi and Jainta Hills and in the coastal areas of Bombay much bone-meal is used for paddy. In West Bengal and Assam according to some of the witnesses, the peasants are convinced of the use of bone meal and they are also aware of its residual effects. Shri J. R. Ghosh who uses bone meal at $1\frac{1}{2}$ maunds per acre for rainfed paddy was of the opinion that it gave an increase of 3 maunds per acre. Next to oil cakes, he thought that bone-meal was the best manure. Shri Goswami of Assam testified that bone-meal had residual effect. In Bombay there was an impression according to Shri D. R. Vakharia of Upaledumalar that bone-meal was superior to the manure mixture but it was not available in large quantities and Shri Shembekar stated that he himself crushed bones in his estate and thus saved Rs. 35/- per ton over buying bone-meal. Bone-meal is much used for garden crops in all the States. In Uttar Pradesh a scheme for the manufacture of bone-meal on a cottage industry basis is being considered.

The compound fertilisers like niciphos, ammophos, and ammonium phosphate were very popular, but are not available now.

OIL CAKES

The type of oil cake used depends on the easy availability of the material in the State. Thus in West Bengal and Assam mustard cake is extensively used, while in Bombay, groundnut cake is the one that is used commonly. In Madhya Pradesh, where there are many oil mills, though groundnut cake is the important oil cake, other cakes like *til* oil cake, linseed oil cake and *mahua* cake are used to some extent. According to most of the witnesses oil cakes are generally popular. They have been used with paddy and vegetables in Assam and West Bengal. In Bombay they are used for surgacane, paddy, cotton and vegetables. In U. P. large quantities of cake are being used for sugarcane and in Madhya Pradesh cake is applied to paddy, sugarcane, and Jowar. A mixture of Mahua cake and ammonium sulphate is being tried in U. P. and has been found to be popular with the ag[illegible]turists for sugarcane. Though other cakes would give b[illegible]er responses, Mahua cake is being used becau[illegible] [illegible] quantities of this cake are available in the S[illegible]

FARMYARD MANURE & COMPOST

The use of farmyard manure has been a [illegible]eral practice with the Indian agriculturists but the m[illegible]hods of storage and collection have often been [illegible]steful. Compost drives, both rural and urban, hav[illegible] met with several difficulties not the least of them being the prejudice of the farmer.

The opposition to the village compost [illegible] from the fact that the methods advocated [illegible] volve extra labour and in some cases ext[illegible] [illegible]se both of which are distasteful to the farmer. S[illegible] [illegible]. C. Paul of 24-Paraganas stated he was using 120 [illegible]unds of cattle dung per acre as manure; he added that [illegible]either he nor any other person in his village u[illegible] [illegible]post because its preparation involved labour [illegible] [illegible] could not afford. However Shri J. R. Gh[illegible] another agriculturist with a farm of 12 acres, stated [illegible] he was preparing compost. In Bombay Shri Shem[illegible]kar (Sholapur) was using cattle yard manure but [illegible] preparing about 100 cartloads of compos[illegible]. In ma[illegible] cases the agriculturist does not feel that the extra lab[illegible] and cost will be repaid by the crop returns. [illegible] Bishan Man Singh of Kanpur, who uses only farm[illegible] manure and not compost, was of the opin[illegible] compost was no better than farmyard [illegible] agriculturists have taken to compost making [illegible] inducements like subsidies or prizes; but when [illegible] are discontinued, they have gone back to their ow[illegible] methods. In West Bengal and Assam this has been the case, but in Bombay there appears to be more enthusiasm. Shri S. S. Salimath, retired Deputy Director of Agriculture, Bombay, opined that in areas where rainfall is more than 30 inches the agriculturists themselves take to compost making without any further indu[illegible]. But it must be admitted that in most of the States the extra compost produced by rural drive h[illegible] limited. Shri Vakharia of Sholapur, was of the opinion that rural compost could be produced f[illegible] nut husk and sugarcane trash. He added t[illegible] compost produced till now is very limited and to encourage more production he suggested that fuel should be provided to avoid waste of cowdung. Both Shri Jamdar and Shri Mundle of Nagpur strongly emphasised that people who burn cowdung should be pe[illegible] particularly in Nagpur where fuel cost is very low.

With regard to town compost, the situation [illegible] different. The main difficulty which was expressed [illegible] almost all the witnesses, who spoke on this, was th[illegible] transport of the material from the compost yard to their field involved expense which was scarcely mo[illegible] the return in crops. Shri Soni of Hotgi (Sholapur) was paying Rs. 3 per ton of compost while actually at the depot its cost was annas 0-8-0 only. Shri Pathak of Pandharpur said that he paid as much as Rs. 5/- pe[illegible] for transport alone. A further difficulty which [illegible] much emphasised by the witnesses of Bo[illegible] Madhya Pradesh and Uttar Pradesh was that the [illegible] compost contained many undesirable materials [illegible] glasspieces, iron nails, etc. which hur[illegible] the men [illegible] beasts working in the fields.

In some places of Bombay there [illegible] [illegible] prejudice to town compost because [illegible] the

est Bengal, stated that he was using tank silt e for his farm and was convinced of its benefits. Water hyacinth compost has been used . M. Hati with success. Shri Rai Bishan Man Kanpur said that he had used town sweepings, field direct without any composting.

MANURE

use of green manure is restricted by the moisture available in the field before the main s on the field. In West Bengal sann hemp *icha* are grown as green manures. Shri Paul growing *dhaincha* and sann hemp for green ated that he preferred *dhaincha* to sann hemp. green manuring is not much used. In lso green manuring is used only to a limited or paddy and sugarcane. Shri Vakharia

up ... moisture for the next crop also. thought that green manure was a g farmyard manure, but could be gro tion water was available in May. I where 70% of the rice crop is gro (broadcast) system, green manurin possible, but some cotton cultivato green manuring in Ellichpur, where manure in between lines of cotton. Shi has about 4,000 acres of land under using green manure for cotton. Sann hemp the month of June, when the rains commence ploughed under at the end of July or first August. In Berar, *urid* is used as green manu cause the farmers believe that sann hemp takes up large quantities of moisture.

e Natural Method of Hatching

(*Continued from page 22*)

over a layer of sawdust and finely sieved wood the top of hay has been found quite good. en pitcher should be so supported on all it is stable and does not rock about with the s of the hen sitting in it. It should be placed lly dark, safe and a quiet room where the hen urbed by frequent passages of family members. ld be taken that dogs, rats and other fowls isturb the broody hen. The nest should be or near ground level so that the hen need not p and thus damage the eggs.

OF SITTING HEN

ien must get good amount of grain feed and ore sitting and should preferably be set in the She should not be disturbed until the following or feeding. After this she should be let out y at a fixed time for food, water and for calls A broody hen will not generally soil the eggs creta unless forced by negligence of attendant y of not letting her out regularly. The hen gently handled by putting one hand under- and other on her back so that the eggs are ged. Sometimes a few eggs are concealed in her this fact should be kept in view while handl- ird so that those concealed eggs may not be Whole grains like wheat, maize, *jowar*, etc. fed to a brooding hen when she is taken out of the nest. Along with it plenty of cool water should be offered. The whole grains taking a longer time for digestion help the hen to sit comfortably on the eggs. The hen should be fed by scattering grains on the ground so that she gets a little exercise. Sloppy food like bran greens and wet mash should be avoided. Such feeds tend to cause loose drooping which would soil the eggs. Some poultry keepers have been seen to give cooked rice to the broodies which should also be avoided for the same reasons. Usually a broody hen goes back to her nest herself after 15-20 minutes and it should not be kept out longer than this time. It is a bad practice to feed or water while the hen is sitting in her nest.

END OF THE PROCESS

After taking out the hen for feeding in the evening of the 19th day it should be continued to sit on the eggs till the hatch is over by the 21st day. On the 20th day the chicks pip on one side of the shell with their beaks and break open the shells themselves.

A clean place should be kept ready for transferring the newly hatched chicks with the mother hen. The hen should be fed but the chicks should not be given any feed for about 48 hours as they have got reserve food in their body in the form of yolk. If the chicks are immediately fed after hatching they are likely to be the victims of over feeding, i.e. may get indigestion, and diarrhoea, etc. First food for chickens should be some finely broken grains like maize, wheat, etc. Whole *bajra* can also be fed.

Role of Molasses in Silage Making

(*Continued from page 15*)

ratoon crops. All these three supplements d in this farm.

ensiling 500 maunds of *anjan* grass, half a f *gur* dissolved in 50 gallons of water was molasses to the extent of 5 per cent in pro- vas also used for preserving green. In order to ne molasses uniformly, it was found necessary ater to an extent of four times its volume.

nderable sucrose was also obtained by chopping th the grass, the entire ratoon sugarcane crops proportion of 2 parts green, and one part the garcane plant. It was observed that the tops, e generally discarded when the cane is harvested grasses and *juar* (Sorghum); sugarcane tops alone cannot make good silage.

Silage obtained from all the above three cases fermented very well and gave very good silage having fine aroma and colour. Cattle relished them well and not a single blade was wasted.

We experience throughout our country acute shortage of cattle fodder either during the summer season or during severe droughts. Hay making is a well recognised method of preserving fodder for the cattle, but the preservation of fodder by means of the conversion into silage opens up a vast opportunity in our country. In silage there is a greater nutritive value. Its special succulence and flavour makes it all the more enjoyable by cattle. Further silage could be preserved over long periods of years and unlike hay stacks, there is

COTTON (Continued from page 9)

2. Application of 4 to 6 mds. of cake at the time of planting.

Uttar Pradesh :

Application of 200 lbs. of sulphate of ammonia preferably at flowering period.

Punjab :

1. Application of 200 to 300 lbs. of sulphate preferably at flowering time.

2. Application of 6 to 8mds. of cake at sowing time.

Delhi :

Application of 6 mds. of cake and 150 lbs. of sulphate of ammonia partly in July and partly in August.

Mysore :

Irrigated areas: Application of 3 tons of compost or F. Y. M. at sowing time, plus 5 mds. of cake and 1½ mds. of sulphate of ammonia one month after sowing.

Rainfed: Application of 5 tons of compost or F. Y. M. at sowing time.

Madras :

Application of 200 lbs. of sulphate of ammonia.

While using sulphate of ammonia, it should be mixed 4-5 times of its weight with F. Y. M. or soil. Cakes and fertilizers after application should be well mixed with soil or drilled.

Plant diseases and pests : Prevention is better than cure. Preventive and control measures for some important pests and diseases are given below:

Pests :

1. *Black headed cricket* (Tidda) : These insects cut the seeds when these are germinating and sometimes the attack is so severe as to resort to resowing. The pest is very active in May. The use of following bait is recommended. The bait should be applied when the crop is sown.

Sodium fluosilicate	..	.. 1 lb.
(Wheat bran or rice husk or saw dust		..20 lb.
Gur jaggery	..	.. 2 lb.
Water	..	..sufficient to mix properly.

2. *Boll worms :*

a. *Spotted bollworm :* The most effective control measure is to prevent carry over of the pest from one cotton season to another. This can be done as follows:

1. Removal of cotton sticks immediately after the picking is completed. Any new sprouts that may appear may also be destroyed.

2. Eradication of alternate host plants during December.

3. Cultivation of plants like Bhendi should not be encouraged.

b. *Pink Bollworm :* The simplest way to deal with this pest is to prevent its moths from appearing year after year and this can be done by killing all hibernating larvae inside the seed by exposing the seed in their layer to direct rays of sun during April, May and June.

3. *White Fly :* This pest is most active in dry climates. The attack disappears with rains. The most effective control measure is spraying with rosin compound when the attack is observed. The insects suck their food from under side of the leaves and these should be sprayed carefully.

4. *Jassids :* This is a serious pest of American cotton and its intensity is highest in humid and wet years. Usually varieties with rough leaves due to hairs on them are resistant to Jassid attack. If this pest is prevalent in your tract please take precautions to select proper variety.

Diseases :

Root Rot : It is one of the commonest disease of cotton. Prevention is better than cure. Once it appears there is hardly any cure for it. The following precautions are necessary.

1. To avoid soils where Root Rot has once been observed. In such soils, proper rotations be followed and cotton to be sown once in 3 or 4 years.

2. Adjustment of sowing periods: Earlier sowings are more susceptible than late sowings. Inter cropping with *moth* or some other spreading crops, e.g. cowpea, etc. can reduce mortality due to Root Rot. The inter-crop should be removed in the early August.

Wilt : This is a serious disease of cotton. It is seen in most serious form in fully grown plants. The

only remedy appears to be in evolution of wilt resistant varieties. Some of these are (1) Jaywant & (2) Vijay.

Red Leaf disease : The appearance of reddening of leaves followed by the shedding. The shedding of leaves is often accompanied by the shedding of buds, flower and bolls. This disease is common in American cotton. The preventive and control measures so far known are :—

To grow Red Leaf resistant varieties, L. S. S., F-216, F-320, and M-4 and MAV, Perso-American, Co3, etc. are some of the varieties.

2. When first symptoms of Red Leaf are observed, resort to application of nitrogen either in the form of cake or sulphate of ammonia or both. This should be done immediately.

3. Avoid growing American cotton in areas containing salinity or alkalinity. Tirak (bad opening of bolls) : In this diseased bolls open prematurely with the result both quality and quantity of the produce is affected. The following precautions are necessary:

To avoid cultivation of cotton in areas having salinity or alkalinity.

2. Proper adjustment of variety and sowing date. When late sowing is advisable the crop should be sown closer, i.e. 1½' between rows. Combination of late sowings and early varieties is preferable.

3. Application of nitrogen in the form of S/Ammonia in the month of August would keep down Tirak. If September temperatures are high, it is desirable to irrigate cotton frequently.

The clean cultivation is the essence of keeping down pests & diseases.

Picking : The seed cotton should be free from admixture of dry leaves, etc. It is desirable that cotton should not be picked early in the morning hours when there is dew. Cotton should be so stored as to avoid damping. Malpractices of admixture of dirt, inferior quality and moisture should be avoided.

Clean picking and keeping it pure should be the motto of every cotton grower.

Marketing : Legislation for the establishment of regulated markets has been enacted in the States of Bombay, Madras, Punjab, Madhya Pradesh and Hyderabad—Deccan. Regulated markets now exist in most of these States and cultivators are advised to sell their produce in these markets and get the maximum benefit of prices.

Harvesting & after: After cotton pickings are over the cotton sticks should be removed and land ploughed up.

The cultivator can now rest himself assured that he can harvest at least a double crop if he practises good cultivation, uses improved seeds, pays proper attention to its irrigation, manuring and control of pest and disease. He will thus help the country in becoming self-sufficient in its requirement of cotton and thus save [illegible]ense money involved on the imports of raw material [illegible] in running the Textile Industry and also enrich [illegible]

[illegible]ultivators in the end are advised to be in [illegible] with the local authorities of the Agricul[illegible]nt.

INDIAN FARMING

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PAGE

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INDIAN FARMING

Important

For immediate attention :

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We have posted renewal reminders to all those readers whose subscriptions expire with the current issue. It will be appreciated if we are advised of the renewal for the new Series Vol. II April 1952-March 1953 in time. All remittances should be sent by M. O. or crossed P. O. in the name of the Agents. In case of crossed cheques bank charges should also be included. Annual subscription remains Rs. 9/- while for six months Rs. 4/8/- may be sent. For Foreign subscribers the subscription is Rs. 9/- plus postage Re. 1/11/-.

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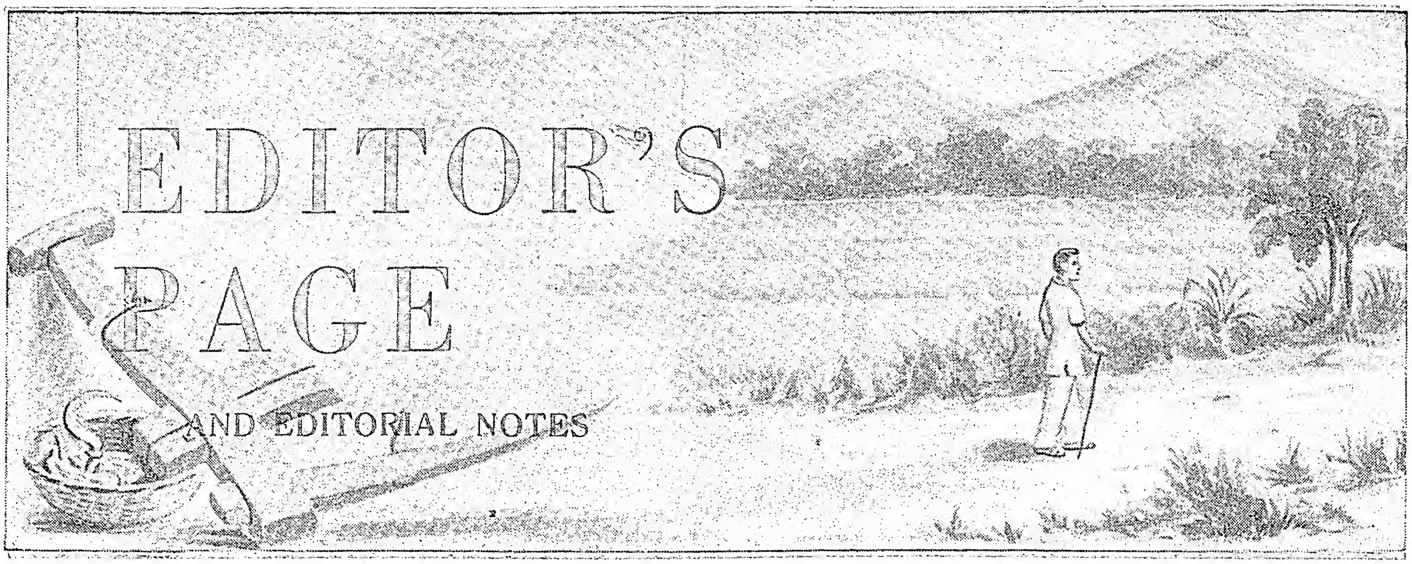


A friend of the 'Indian Farming' came out with a poser about the care and maintenance of agricultural machinery. It has been pointed out time and again that an advisory service to help the prospective buyer in selecting the right type of machinery suitable for the soil conditions and the requirements of the purchaser is necessary. This is because with so many types of machines the two essentials are pre-purchase guidance and after-sale service. In many cases the cultivator gets some service, in some cases he finds it difficult to locate the person who could set his machine right.

However, a third factor has also come to light and the friend who posed a simple question has set a problem which must be solved. A machine has hundreds of parts ranging probably from a small pin to the engine. In selling a machine the dealer has to arrange to keep all the parts ready for emergency but is it necessary for the emergency to arise so often as it does? Obviously not if the man who owns the machine and the man who runs it both know a little more about maintenance than they do now. It might so happen that the dealer might run out if a small part just at the time when one of his patrons comes rushing right at the time when even a day's delay would result in heavy loss. This would reflect badly on the dealer but the cultivator would lose everything. There appears to be a way out of this predicament...training the people who have a stake in the efficient running of machines. There are, for instance, a number of tractor training schools which do part of the job. This however is not enough. Somebody belonging to cultivator's own people should be trained and manuals of care and maintenance should be prepared in the local languages to enable the users to locate minor faults right on the spot and set them right.

The task of getting the cultivator to know more about his machines is not easy and the co-operative planning of agricultural information would lend itself to a campaign for propagating the correct way of doing things, which in general are common to all machines. Items such as keeping the engine free from dust, the right methods of refuelling and storing oils and lubricants, care of the tyres etc. have to be more popularly known. This could only be done if such associations as the Tractor Dealers' Association, Oil Companies Group, Tyre Manufacturers' and such other institutes join hands with the Government in setting up a general advisory body and in getting the right type of literature prepared for India-wide distribution.

Of course one might argue that everybody has his own interest to serve but, in general, such a move would serve all interests collectively and leave the competitive field to those who enter it. General practical hints on how to handle all types of machinery or the right way to go about getting things done will make for more interest. Even a compendium of all service organisations and depots set up by various agricultural trade interests prepared for reference in some of the major languages of the country would be a right step at the right time.

The ultimate result of such a move would be to encourage the cultivator not to lose patience and run for every little thing to the dealer but be more self-

reliant, take more proper care of his machines and learn to take more work out of them without breaking them to pieces. The agricultural authorities would be spared a lot of hectic running about trying to help the farmer set things right and the dealer will find that he no longer is a much abused man.

PREPARATION OF COMPOST BY MUNICIPALITIES

The scheme under which municipalities have been composting town refuse has been continued by the Government of Bombay for a period of four years, from March 1, last.

This scheme was first sanctioned in 1947 for a period of five years. Its object is to train municipalities and such of the village panchayats as have the necessary staff for the collection of village wastes, in the methods of composting refuse, as one of the steps to increase the output of organic manure in the State.

According to information available, a total of 233 Municipalities and 60 Village Panchayats were trained in compost making. Of these 181 Municipalities and nine Panchayats reported production during 1950-51 of 2.62 lakh tons.

The current production figures justify this extension and all efforts must be made to increase production.

UTTAR PRADESH : NON-OFFICIAL EFFORT

Forty thousand acres in 300 villages of Basti district in U. P. have been selected for intensive development by non-official effort.

Mr. K. D. Malaviya, former Development Minister of U.P. and now a member of Parliament from Basti district, is the Chairman of the Development Council formed to pool the resources of the co-operative movement in the area.

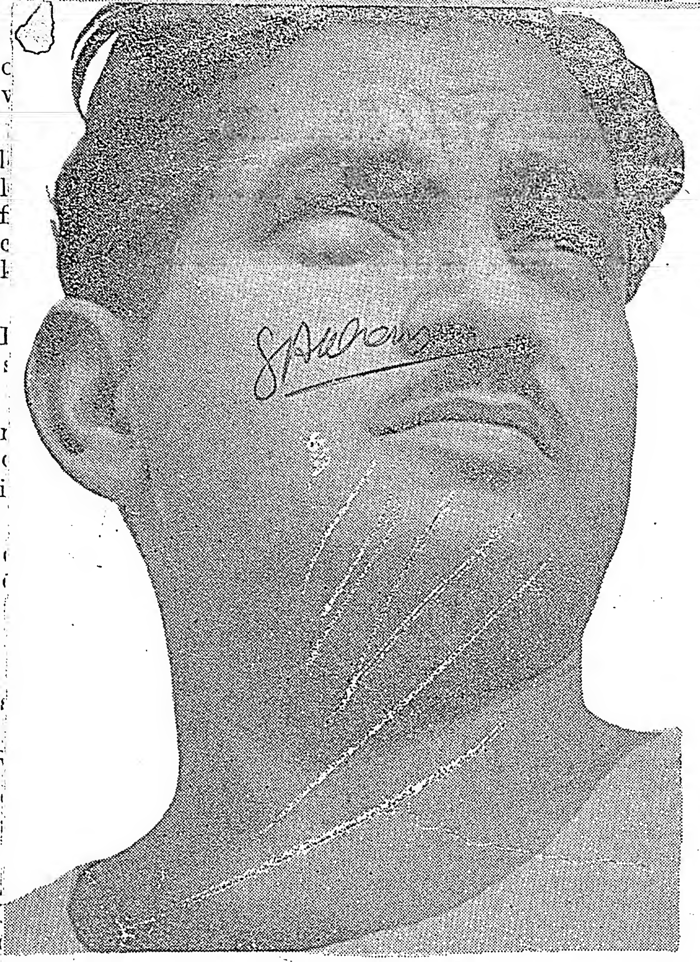
The plan, based on the principle of self-help and co-operation of villagers, is a modification of the pilot development project of Etawah launched during Mr. Malaviya's term of office. It aims at integrating the co-operative societies having a membership of 14,000 into one unit.

The emphasis on co-operation is worth noting because integration and co-ordination of co-operative movement is bound to lead to increased participation of the people.

COVER PICTURE

THE BEST MILCH TYPE COW IN INDIA

The Indian Council of Agricultural Research decided to award a prize of Rs. 1000, donated by Shri Purshotamdas Thakurdas, to the best milch type cow in India. The animal which has won this prize this year is 'Gulzar'. It is also the winner of the prizes awarded at the 11th All-India Cattle Show 1952 for the best Sahiwal Cow, Best Milch type cow and Best cow. 'Gulzar' is owned by His Holiness Satguru Partap Singh Ji of Jiwan Nagar, Sirsa, District Hissar (Punjab). She is 5 years and 6 months of age and has already completed two lactations. Her yield during the first lactation was, 6,000 lbs. and in the seeond 7,500 lbs.



THE MAN OF THE MONTH

RAJA—A Flight From Law To Land

By

SHER SINGH

MAY 1943 was an exceptionally hot month that we have had in Lucknow at least during a good many years that I have passed in this picturesque town of domes, parks and gardens. The mercury even in the nights used to touch 110 sometimes. I had finished my educational career and was due to leave on a short photographic assignment while Raja intended to study Law after graduation. This was the last night that we were having together in our beloved hostel in front of which lay the expansive Hockey grounds and the main University building glimmering under a heavy moon. Raja had given many a brilliant display in hockey on this very ground—as a matter of fact it was here that he had won laurels as one of the finest players in the Province. Night was past its bloom and the morning hours were drawing nigh but we were miles away from sleep. Each one of us had his own problems. For me the future, after the short assignment that I had managed to secure, was bleak. I had either to enter journalism or to take up photography as my career. Raja was afraid of law. He thought he could never be so promising in the class as he was on the field. Any way he had to come back to the University in the next session and I had very little hopes of seeing him again for some time to come.

FARMING REPLACES LAW

During the next four years I heard very little of Raja, formally known as Kumar Naresh Singh, and probably had a couple of hurried opportunities of meeting him. I again settled down in Lucknow and one hot summer afternoon I was sitting down on my lawns actually gasping for breath when all of a sudden Raja dropped in as if from no where. He was perspiring, tired and pulled down. It was both a delight and a surprise to have met an old intimate friend. My first thought was that he had come to Lucknow on some legal assignment and the first question that I asked him was about his success at the bar. He looked at me and gave a queer smile that I had never seen on his face during my four years of association with him. A cold drink again brought him back to his old cheerful self. "Practice at the bar" he said contemptuously, "Far away from it. I have never been able to pass my law previous even". I was actually amazed. "It is a strange irony of fate", he continued, "I am now being forced by my eldest brother to go and look after our farm situated twenty miles from Lucknow on the Sitapur Road".

FORCIBLE CONVERSION

I had always been enamoured of an out door life and particularly life on a farm. I personally felt that it was one of the best opportunities that a young man could get. I was myself certain that Raja would take up this life very willingly but unfortunately the case was different. For nearly fifteen minutes I spoke to him about the glorious mornings of the country side, excellence of climate, and all the boons that an out door life could bestow. He seemed to be very slightly moved and after a long sigh he said, "you don't understand how we have to live on a Farm. There is abso-

A bird's eye view of the Kunwarpur Farm

lutely no company. The days are passed either reading, which I hate, or sitting dumb. I had been there for fifteen days and now I am never going to get back". This ended our conversation and Raja left disappointed feeling that I could not sympathise with him.

For a year or so Raja's trips to his farm were just like short picnics. He would go to Kunwarpur, a small hamlet where his farm is situated, stay there for a couple of days and then come back to Lucknow and stay with me. He always used to feel bored by even a day's halt at his farm. But he took it up.

RAJA MAKES GOOD

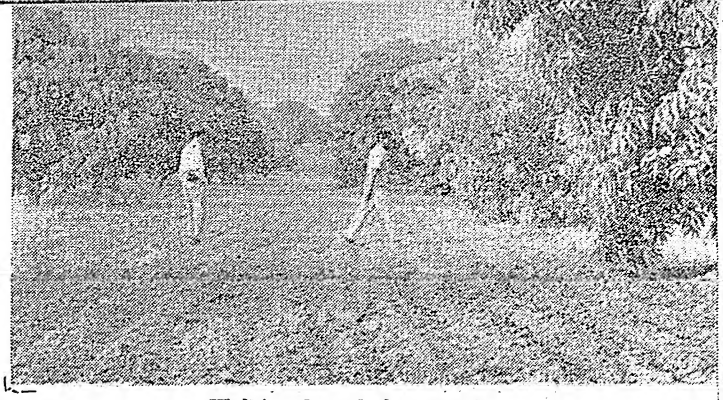
When I landed in the Agriculture Department in 1950 my interest in Raja's activities increased. By now he had become a full fledged farmer—enlightened, enthusiastic and industrious. My contacts with him for the last two years have practically been fortnightly. Whenever I pass that way I drop in to see him and always I find him busy laying down experiments in small plots which he has set aside for this purpose. His spare time is spent in reading all available literature on agriculture both foreign and Indian. He is keen to get every printed word on agriculture right from the one

Raja grafts his own mango-plants

pice leaflets produced by the U. P. Department of Agriculture to the Indian Farming issued from Bombay. Besides being a voracious reader of this type of literature he is also very keen on visiting the fields of his neighbours who have always benefited by his knowledge. I often feel surprised at this sudden change in his life. A man who could never think of leaving the town and probably had the usual aspirations of either settling down in the bar or in service, a man who was keen on sports but slack in his studies has now taken up farming as his career. If now I ever ask him to come down to Lucknow he smiles comtemptuously and says, "Oh, I am very happy here, I do not want to get into the din of the busy town life again. That is finished for me for ever".

THE FARM IMPROVES

Raja took over charge of Kunwarpur farm in 1947. The farm had an area of 120 acres, forty of which were under a mango orchard. There were twenty buffaloes then and the condition of the orchard was pitiable. It was overgrown with dense weeds and was an abode of bluebulls, wolfs and jackals. The first thing that Raja felt after he settled down was that the buffaloes



Walking through the orchards

terribly low. The income from the orchard was only Rs. 2,200/- and the agricultural crops like wheat, barley, paddy, peas, sugarcane, gram, *arhar* and *urd* that were being grown were yielding an income of about Rs. 5,000/-. Besides the meagre out-put of the buffaloes the labour problem in Kunwarpur then was acute.

Raja's agricultural knowledge was nil, the condition of the farm was pitiable, and the slogan of GROW MORE FOOD was haunting him all the time. He ran frantically for advice and invited officers of the Agriculture Department to his farm. Raja started working on a few points gathered from here and there about manuring, improved seeds, better rotation of crops he took to mechanised farming. The eradication of weeds in the orchard was a problem to him and in early 1948 he purchased a John Deere Model A tractor with all the implements.

IMPROVED METHODS

Raja took to composting and green manuring of wheat, sugarcane and paddy crops by Sanai and Moong Type One. He dug fifty compost pits and green manured about thirty five acres in the first year. The results were encouraging and the yield was more than doubled. He also tried leaf mould, ashes, canal silt, bone meal and phosphate of ammonia, and got a good response.

For irrigation the Kunwarpur Farm has a minor canal running through it. After about a couple of years Raja got disgusted of the canal system as he could not get enough water at times when he required. Moreover he is of opinion that the canal waters bring in the

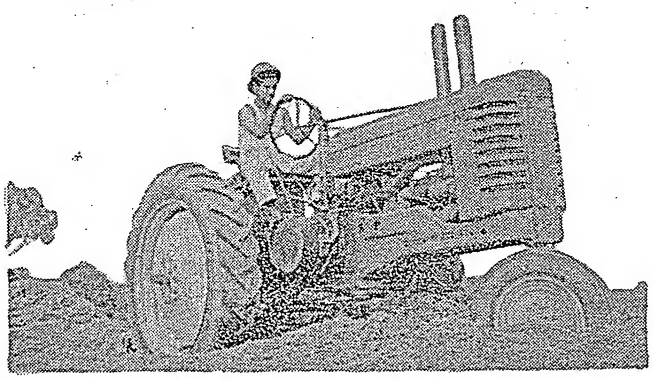
A bumper wheat crop each year

seeds of different types of pernicious weeds which are difficult to eradicate. He has purchased a pumping set in 1950 and proposes to have more pumping sets and masonry wells to supplement the canal system. He believes that high yields and bumper crops are not possible without proper irrigation.

He holds that until the average cultivator is not told and made to act on better and more lucrative rotation of crops his income cannot go up.

UP GOES THE INCOME

Soon after he purchased the tractor he made up his mind to eradicate the weeds from his 40 acres orchard. He ploughed and reploughed, harrowed and reharrowed till there was no trace of weeds on that land. The mango plants that were drying up came back to life. In the orchard Raja is taking leguminous crops which besides giving him an extra income fix nitrogen in the



Tractor has also helped a lot

soil. He has 120 varieties of mangoes besides litchi, guava, banana, jack-fruit, citrus fruit and sapatu. The income of the orchard from Rs. 2,200/- in 1948 has gone up to Rs. 15,000/- in 1951 and his target is Rs. 25,000/- which he hopes he will be able to achieve within a couple of years. He has now taken to grafting himself.

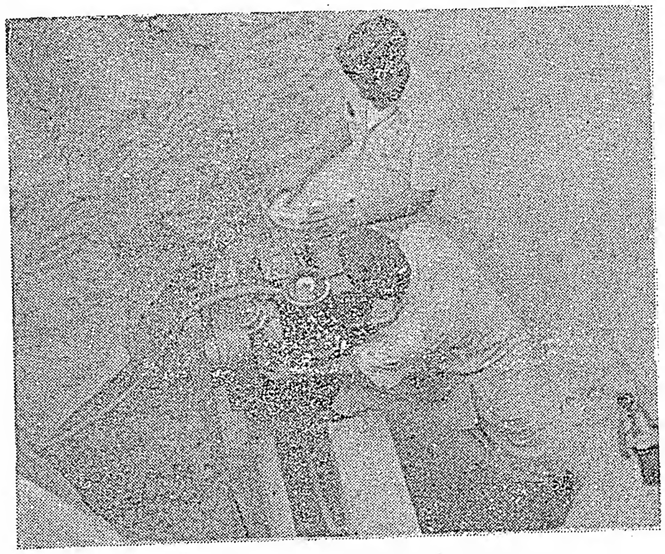
ALSO A DISTRICT CHAMPION

He is an ardent believer in crop competitions because they enthuse the farmers a lot. He has produced the highest quantity of Moong Type One in the district of Sitapur and this year he has been declared the winner in wheat competition on the district level. His produce was 46 maunds 10 seers an acre. He says that he could have produced more provided he had better irrigation facilities.

A comparative chart of the yields of some of the crops per acre during the years 1948 and 1952 is given below :—

		1948	1952	
1.	Wheat	10 maunds	46 maunds 10 seers	
2.	Barley	6 ,,	35 ,,	
3.	Paddy	20 ,,	39 ,,	(1951)
4.	Sugarcane	600 ,,	1375 ,,	
5.	Potato	150 ,,	390 ,,	

The nett profit per acre from the agricultural portion of the farm when Raja took over in 1947 was Rs. 75/-. Today it is more than Rs. 250/- per acre, and he thinks it should at least reach the figure of Rs. 500/- per acre for big holdings.



Water has to be pumped up from a great depth

BROTHER, AN OLYMPIC HOCKEY CHAMPION

They are six brothers and five of them are outstanding Hockey stars and have represented the provincial teams during their days. Babu, the youngest is captaining the Indian Hockey team going to participate in the World Olympics at Helsinki. They have identical hobbies, photography and shooting being the favourities.

The Kunwarpur Farm gives a sumptuous monthly allowance to all the brothers who are busy with their own professional activities.

Raja aspires to have a dairy and a poultry farm but he is handicapped by the fact that there are no finances at his disposal and no pasture lands near about. He is very much interested in the reclamation of Usar lands and has recently acquired a 24 acre Usar plot to conduct his experiments on it. Besides this he has reclaimed 90 acres of waterlogged lands infested with weeds and is taking paddy and gram on this farm. He has put up a small bund and has made arrangements for proper drainage.

FROM DESK TO FIELD

He thinks that the Agriculture Officers should have a lot more field work to do than what they do on their desks.

(*Continued on page 32*)

Women workers add a bit of colour to an already colourful scene

'ls ne


Active hands get dirty...
and where there's dirt there's Danger from germs!
Wash often with
LIFEBUOY SOAP
it protects you from the germs in dirt!
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Hints to the Farmer :

GREEN MANURING FOR BETTER CROPS

By A. R. KHAN,
Division of Agronomy, I. A. R. I., New Delhi

WITH *rabi* harvest just over, farmers are getting ready for the next planting. They are now being asked to produce food and fibre, as they never produced before. They are required to feed and clothe an ever increasing population of the country.

To do this, however, they must feed the soil first, which, due to continuous cropping without adequate manuring, has become completely worn out. In our livestock system of farming, the feeding of crops to cattle and the return of manure produced to farm land, have not been maintained. About two-thirds of this manure is burnt and the rest, as a result of wasteful methods of handling, loses its nutrition. As an offset to these losses the farmers should adopt other forms of manuring, of which green manuring appears to be the cheapest.

The practice of green manuring is very old in India. It has been found useful for paddy in Madras, Bombay, Bihar, Orissa, West Bengal, M. P., and U. P., for sugarcane in Madras, U. P., Bihar and M. P. and for cotton in Bombay, Madras and U. P. An increased yield upto 100% has been recorded with some of these crops.

COMMON GREEN MANURE CROPS

An ideal green manure crop should be quick growing, succulent, easily decomposable with low moisture requirement, and able to produce maximum amount of organic matter and nitrogen. Some such crops in general use are: Sannhemp, Dhaincha, Pulses of the Phaseolus sp., Guar, Cowpea, and a few other leguminous plants such as Kulthi, Indigo and Arhar. A short description of the promising ones follows.

(1) Sannhemp is the most outstanding of all the green manure crops. It can be sown with rains and attains a height of 4 or 5 ft. in a few weeks even on poor soils provided they are not waterlogged. Sann is most popular in U. P., Bihar and M. P. but is also grown in other parts of India. The seed rate varies from 30 srs. to one maund per acre according to the nature of soil type. An average crop adds about 75 pounds of nitrogen to the soil per acre.

(2) Dhaincha occupies the second place after sann, for the purpose of green manuring. The advantage with this crop is that it can withstand adverse conditions of drought, waterlogging, salinity, etc. without much deterioration. It is the chief green manure crop for swampy rice areas in Madras, Orissa, West Bengal, Assam and Bombay. The seed rate used is from 15 to 20 seers per acre. An average crop adds about 70 pounds of nitrogen per acre.

(3) There are a number of *kharif* pulses, belonging to the species 'Phaseolus' used for green manuring. Of these moth, *urid* and *mung* are important. In Madras, and Bombay another variety of this species known as 'pillipesara' in Madras and 'ranmatki' in Gujarat are also popular. This adds about 50 lbs. nitrogen per acre to the soil.

In U. P. a variety of Mung, called type 1 has recently been found promising. It adds about 40 pounds nitrogen per acre when green manured after taking the seed. The yield of grain is also reported to be about 6 mds. per acre. Seed is sown at the rate of 6 seers per acre.

(4) Guar is used as a green manure crop in the drier tracts of N. W. India. It adds about 56 pounds of nitrogen per acre with a seed rate of about 20 seers.

Besides the above summer legumes there are also a few winter legumes like berseem and *senji* which are grown in northern India under irrigated conditions.

(5) Berseem grows luxuriantly during winter with irrigation. In all there are about six cuttings of green fodder taken from this crop. For the purpose of green manuring, however, it is ploughed down at the stage of 4th cutting. It adds about 54 pounds of nitrogen per acre with a seed rate of 12 seers.

(6) *Senji* is another winter legume of great promise adding upto 120 pounds of nitrogen per acre under excellent condition of growth. The seed rate is 25 seers per acre.

(7) Khesari is another *rabi* legume taken in rotation with rice. It grows well on residual moisture and irrigation is generally not necessary. The quantity of nitrogen added through green manuring is about 55 pounds per acre with a seed rate of about 30 seers.

CULTURAL PRACTICES

In order to draw maximum benefit from green manuring the farmer should have a fair knowledge of cultural practices involved in the process. On these depend, generally, the success or failure of the system. The sowing of green manure crop may be so arranged as to facilitate its burial at a stage when it would furnish the maximum amount of plant food to the soil.

The following hints on cultivation may, it is hoped, prove helpful.

(*a*) *Soil*: Green manuring can be done on all types of land varying from clayey to sandy in nature. A heavy soil can be made porous and crumbly by the addition of organic matter and thus allow air and water to move freely in it. On light soils, it has a binding effect giving the land a 'loamy' character. In the absence of good structure produced by green manuring,

soils neither hold moisture nor stimulate all those biological and chemical processes jointly responsible for an increase in soil productivity.

(b) *Climate*: For the successful cultivation of green-manure crops the climate should preferably be humid, with an average rainfall of about 25 inches, well distributed over the whole period of growth and also a few weeks after the crop has been buried.

If crop is sown in hot weather one or two irrigations may be necessary before the break of monsoon. For winter green-manuring irrigation is essential.

(c) *Preparatory tillage*: The land is prepared and seed broadcasted by giving a couple of cultivations. In a dry season the seed may be covered by running the plank over. As a rule green-manure crops do not need much cultivation for seed-bed preparation.

(d) *Time of sowing*: There cannot be a general recommendation for a vast country like India having a varied type of climate. The consensus of opinion is in favour of early sowing after the break of monsoon. In Madras, under irrigated conditions, the sowing of green-manure crop has been recommended as early as middle of March. Sowings are done by about middle of June in eastern, and a fortnight later in the northern part of India. The best time for green-manuring in Bombay for sann, dhaincha, and pulses has been suggested as June or early July. The advantage of establishing the crop earlier than the setting of monsoon is to resist the damage from heavy rains.

(e) *Time of burial*: Between sowing and burying of the crop there is little to attend, except watering in the irrigated tracts, if rains fail. From the results of experiments it appears that a green-manure crop may be turned under at a stage when it is just about to flower. This may roughly coincide with a period of 8 weeks from sowing in case of most crops. For *rabi* legumes the time will naturally be more.

(f) *Method of burial*: This is best done with the help of iron ploughs, which invert the soil. To do the job efficiently the felling of crop with beam, before ploughing, is advisable. On mechanised farms the operation can be nicely done by means of a harrow plough.

The depth of ploughing-in of green crop, especially its proper incorporation into the soil, is very important for quick-decomposition. In light soils the crop, as a rule, is buried deeper than the heavy ones.

Opinions differ in regard to the raising of crop at site or elsewhere for the purpose of burial. Experimental evidence is in favour of burying at site though, at times, it becomes difficult when the land is waterlogged. The growing of crop outside is not altogether without advantage as the transfer of moisture and soil nutrients from one field to the other is accomplished.

(g) *'Time' interval between burial and sowing of next crop*: Green-manuring is in short a practice of 'timings'. It succeeds only when the time of burying a crop fits in with the time of sowing the following crop. An experience of the interval required for the green crop to decompose and produce nitrates is essential. This is generally considered about 2 months under normal conditions. Those farmers who can arrange their sowings in a manner that the nutrients produced by the green-manure crop may not be lost due to leaching or reduction are successful; others are not. If this is rightly done green-manuring not only becomes a sound

IMPROVED VARIETIES OF FODDER CROPS FOR THE PUNJAB

By H. C. MALIK,
Fodder Botanist, Sirsa (Punjab)

THE most practical economical method of increasing crop yields is through the use of high quality seed of adapted varieties. In spite of good seed-bed preparation, addition of abundant manures, and fertilizers into the soil, and the best method of sowing, the results will be inferior and disappointing unless good adapted seed is used. It has been estimated conservatively that 15 to 20% increase in crop production can be brought about by the wide-spread use of the most satisfactory varieties.

There are fewer varieties of most of the forage crops from which to choose than is a case with cereals, vegetables and other crops. On the other hand, there is a large choice of crop plants for use, at least in irrigated areas, as for example, there is a number of varieties of Sorghum, lucerne, rapes and oats and a limited number of varieties in crops like moth, cowpeas and *senji*.

Since yield is the primary consideration in the growing of forage crops, the importance of selecting the right variety cannot be over-emphasised.

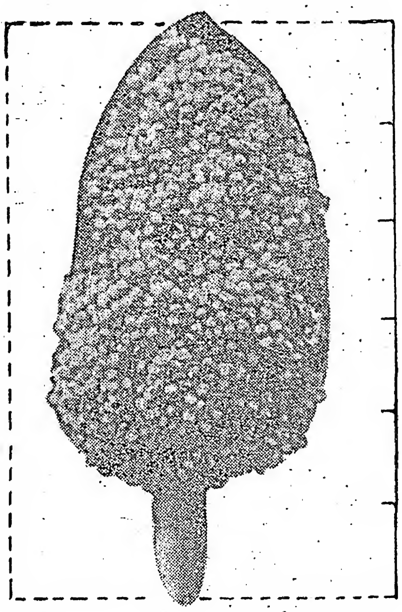
The varieties of fodder crops which have been evolved or introduced with marked degree of success in the Punjab State as a result of the research work at the Fodder Research Station, Sirsa, are given below for the benefit of the Indian farmer so as to enable him to make a wise choice suited to his requirements.

SORGHUM (*JOWAR*)

Though *jowar* is an important grain crop of the Indian Union, it is a premier *kharif* forage crop in the Punjab. On account of its admirable adaptability to varying soil and climatic conditions and high sustaining value, no other crop is considered equivalent to it in forage value during the summer season.

The growing season of the crop ranges from early April to the end of October or early November.

A number of varieties has been evolved at the Fodder Research Station, Sirsa, out of which Nos. 20 and 263 need special emphasis.



A compact ear of JOWAR No. 263 showing attractive creamy grains.

No. 20 is a tall growing variety with very lax ears having brown small seeds with persistent purplish or black glumes. On an average it takes 66 days to become ready for fodder and 102 days to ripe. This variety is eminently suited to dry farming conditions where it excels all others in forage and grain yield. Being non-sweet and thin stalked, it forms very good *karbi* which can be stored for long durations without deterioration. The crop can be sown any time from the end of March to the end of July. It has yielded 470 maunds per acre of green fodder and 9½ maunds of seed per acre at Sirsa. Yields are low- and -vary much under dry farming conditions according to the time and quantity of rainfall.

No. 263 is a medium tall growing variety. It is very sweet with compact ears having bold attractive creamy grains. It is a dual purpose variety which gives very high yield both of green fodder and grain. On an average it has given 600 maunds of green fodder and 8 maunds of grain per acre. It is susceptible to borer attack but to a much less extent than other sweet varieties. Because of sweet and juicy quality it is very nourishing and increases the flow of milk.

It is primarily recommended for cultivation under irrigated conditions but does quite well under dry farming conditions where there is sufficient rainfall during its growing period. The crop is sown from the beginning of May to the end of July, using 24 to 30 seers seed-rate per acre for fodder. It requires two irrigations to become ready for fodder. Crop for raising seed is sown in the end of July using 6 to 8 seers seed-rate per acre.

COWPEAS No. 1

Cowpeas No. 1 is one of the most useful summer legumes. Not only it provides forage of high nutritive value but improves the fertility of the soil on which it is grown. It can also withstand moderate shade and therefore can be grown in orchards. Cowpeas grown mixed with non-legumes like maize form a very balanced feed for livestock.

Crop is sown from the beginning of March to the end of July but early sowings mixed with maize enable availability of green forage at a time when berseem crop is almost over in May. Ten seers cowpeas mixed with 20 seers maize per acre give very high yields of about 450 maunds forage per acre within 70 days.

SUDAN GRASS

It is a thin stalked variety of Sorghum (*jowar*) which tillers very profusely and enables green fodder to be obtained at a time when berseem is almost dry. The crop is sown at the rate of 10-12 seers per acre from middle of March to middle of July. Early sown crop provides fodder in May-June and gives 3-4 cuttings till September-October. Late sown crop either gives one cutting of forage or it can be allowed to ripen seed.

It yields 400-600 maunds of green fodder during the season in 3 cuttings and gives 4-6 maunds of seed if allowed to ripe. The same quantity of seed is obtained if after harvest, the field is not ploughed up but allowed to sprout and grow in next March-April.

TEOSINTE

It is another high forage yielding non-legume which grows during the *kharif* season. Sowing time ranges from early March to end of July but sowings in June-July make good growth and supply large quantities of green fodder during September-October when other *kharif* fodders are almost over and *rabi* ones have to be sown.

It is sown at the rate of 16 seers per acre for fodder and 8 to 10 seers for raising a crop of seed. Yields of 400-500 maunds per acre are common under irrigation.

BERSEEM

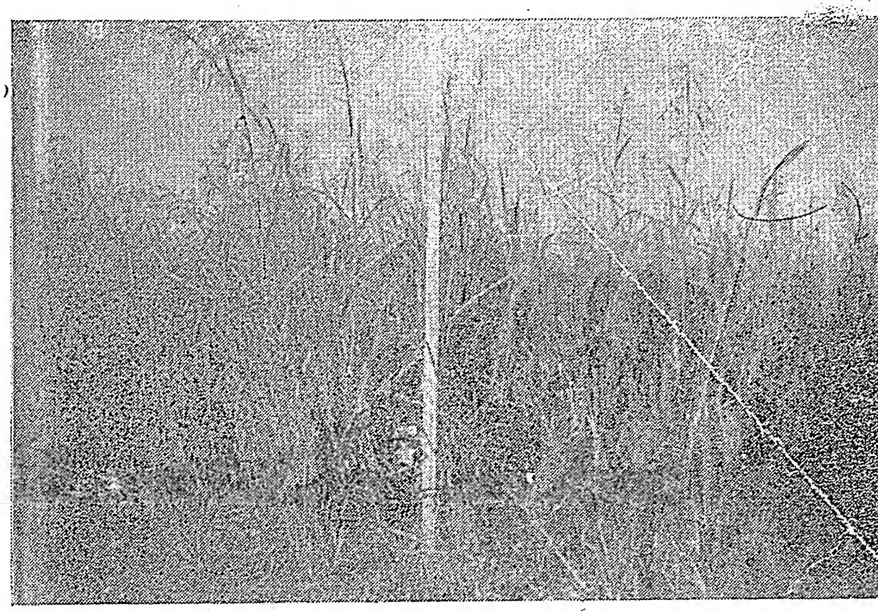
Berseem is the premier fodder crop of the *rabi* season. Being a legume it is highly restorative and provides very nutritious and succulent feed for all kinds of livestock. The crop is sown from the end of September to the end of October under irrigation, using 8-10 seers seed-rate per acre. Pre-inoculation of the seed with berseem culture induces good growth and is conducive to high forage yield. Berseem makes slow growth to start with and takes on an average 50-55 days to become ready for first cutting. Usually forage yield is low in the first cutting, but a slight admixture, of say one-quarter seer seed of Japan rape (light green leaved) to an acre enables very heavy forage return. Thereafter crop is ready for cutting in 35 to 40 days and gives 4 to 5 cuttings of green forage yielding 600-800 maunds and even more per acre during the season. As growing of berseem enables large forage returns in one season it enables sufficient area to be released for other cash crops during the winter season.

It is desired that weeds and *kharif*-free seed should be used. If it is required to raise a seed crop, it should be left to mature seed after taking its three cuttings. Crop ripens in May and yields 4-5 maunds of seed per acre.

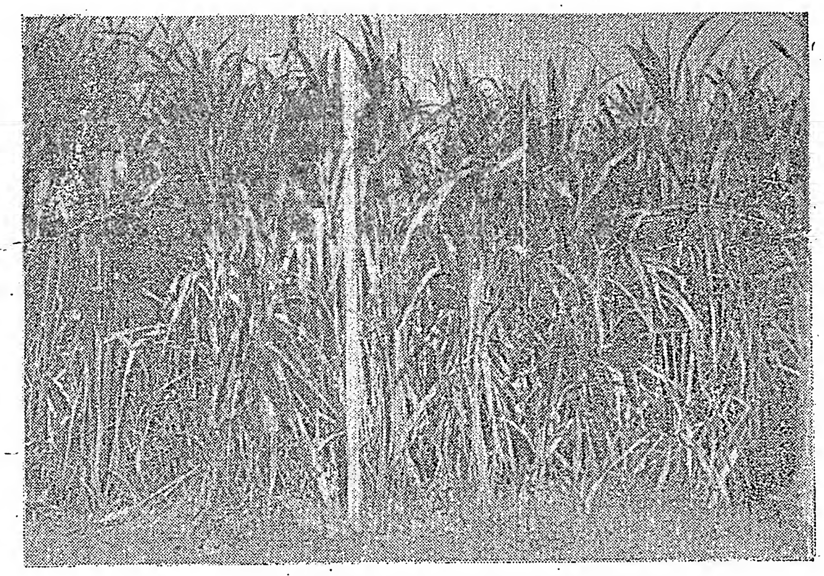
OATS

Oat is a highly sustaining and very heavy forage yielding non-legume of *rabi* season. There is a number of varieties, viz. early and late maturing of this crop suited to different conditions. Early maturing varieties include Brunker 10, Weston 11 and I. P. Hyb. 3 and late maturing varieties include FOS 1/20, Algerian 19 and Fulgham 15.

The crop is grown both under irrigated and dry farming conditions in the winter season. Its sowing starts from October and is continued as late as December when it is too late for wheat. Twenty-four to thirty seers seed is enough to sow an area of one acre. In case of early sown crop it may give two cuttings.



Teosinte (Makchari)—a non-leguminous fodder crop having tall leafy growth

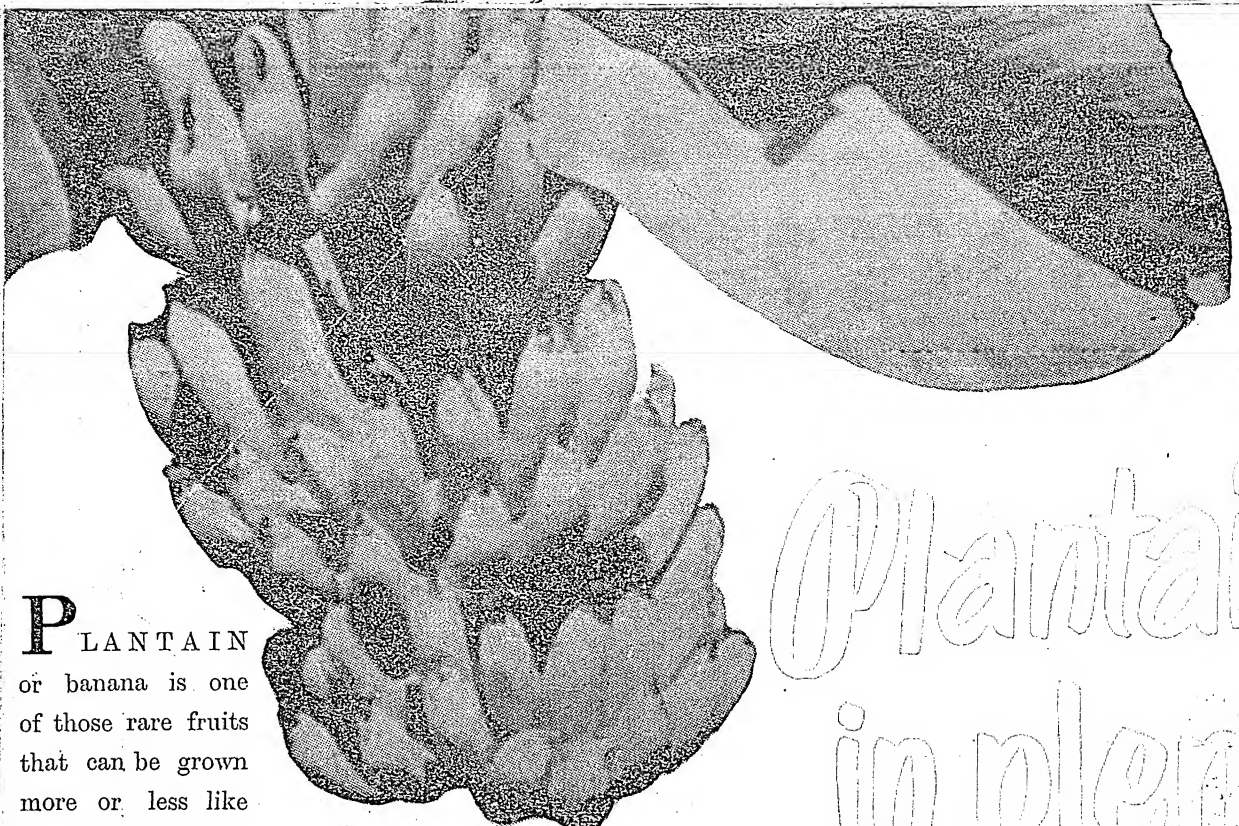


Sudan grass—a thin-stalked varity of Sorghum in early stage

RAPE

Japan rape (light green leaved) is an improved variety of rapes which not only gives high forage yield but is highly sweet and palatable. The crop is suited to both irrigated and dry farming conditions and sown from the end of September to the end of November. It is grown alone as well as mixed with other crops like berseem, wheat and gram. Two and a half to three seers seed is enough to sow an acre and yields on an average 400-500 maunds under irrigation and 150-200 maunds under dry farming conditions.

It is advisable for farmers to select a variety which is suited to their requirements and conditions.



Plantains in plenty

By B. L. CHOUDHRI, Sewagram, Wardha

PLANTAIN or banana is one of those rare fruits that can be grown more or less like an annual crop. The crop begins to give fruits in about 15 to 18 months and hence can be profitably included in a rotation plan of vegetable garden. The fruit is rich in food values and is very high yielding. It therefore forms one of the most important crops for growing more food.

The plant is hardy and easy to grow but being tropical or sub-tropical in nature it cannot stand severe winter. It can be grown upto an elevation of 5,000 ft.

Banana needs a rich, well drained soil. Any soil liable to water logging and severe cracking in the summer is unsuitable for banana cultivation.

There are two main types of fruits: One banana and the other plantain. These two are quite distinct from each other. Banana is commonly used as a ripe fruit whereas plantain is used as a vegetable and needs to be cooked to be palatable. Plantain is a coarse type. There are however some varieties which may be used for both cooking and ripening.

CULTIVATION

In a drive to attain self-sufficiency in food many cultivators of Wardha district in Madhya Pradesh have included banana as an important crop of their kitchen garden. A brief note on the method of cultivation followed by them is given here for the benefit of the readers.

A *kachar* or any medium type of soil is selected. The plot should be on a high area. It is ploughed by an iron plough in February-March and is then harrowed by a *bakher* to break the clods.

Pits are then dug at 6 to 8 feet apart as the variety grown is a dwarf-type. It is locally known as 'Bhusawal'. For tall growing varieties pits should be made 8 to 10 feet apart. Layout is generally done in square or oblong formation. In the latter case 6 feet spacing of plants within the line is given and the distance between the lines is kept at 8 feet. The size of the pits should be 2 ft × 2 ft × 2 ft. They should be got ready by the month of May. They are left exposed to the sun for a fortnight or so. They are then filled with a mixture of garden soil and night soil compost. Every pit should receive at least two baskets of manure. Pits are filled upto about six inches above the ground level so that no depression is formed in them after the setting of the soil.

Planting is taken soon after the first few showers in June-July. Planting should be completed in July as delay adversely affects the yield of the crop. Plants are raised from suckers. Water suckers with broad leaves and stunted growth are not suitable for propagation. Pointed, vigorous and quick growing sword suckers are selected for planting.

Suckers selected for planting should be carefully separated from the mother plant. The digging should be so done that the least damage is done to the rhizome. There will be some eyes growing on the rhizome of the sucker. They should be cut off. Likewise prune off all the roots upto about an inch and cut off the head of the suckers about 6 to 8 inches above the rhizome. The cut should be slanting. The sucker is now ready for planting. Planting should be done firmly in the centre of the pit. Planting is best done on a cloudy day or when it is lightly drizzling.

AFTER-CARE

Do not allow the weeds to grow in the field. Keep it clear and well mulched. The plant has a tendency

to throw suckers from the side. All growing suckers should be removed.

The plants need liberal irrigation. Watering once in a fortnight during winter and once in a week to once in four or five days in summer should be done. In no case the plants should be allowed to suffer for want of water.

It is a gross feeder; hence needs plenty of manure. A top dressing of compost is given during October-November followed by another in the beginning of the rainy season. The plot is earthed up at this time. If available non-edible oilcake is also applied.

The plants begin to flower after about 12 months of planting in July-August and the fruits are ready for harvest from December onwards. After the formation of a certain number of whorls there is no fruit setting. When this stage is reached the lower portion of the inflorescence is cut off. As the fruits develop the plant should be staked otherwise it is liable to fall down due to the weight of the bunch.

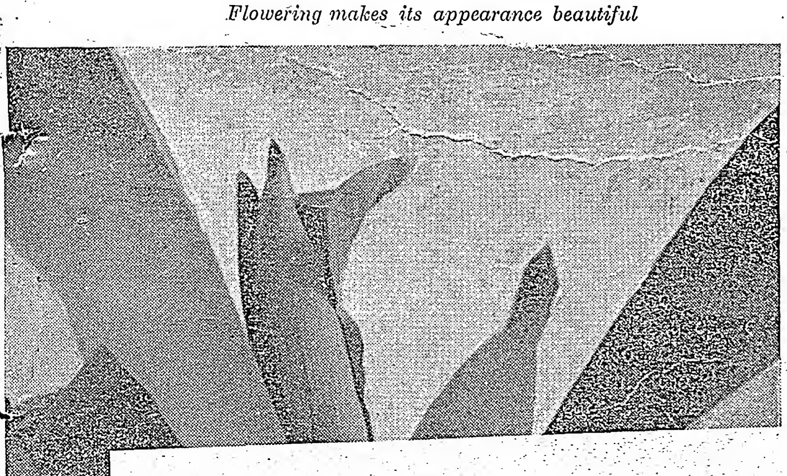
If it is desired to take a ratoon crop allow only one sucker to grow by the side of each fruiting plant. This will become the mother plant for the ratoon crop. Only one ratoon crop is taken. Dry leaves from fruiting plants should be regularly cut and removed.

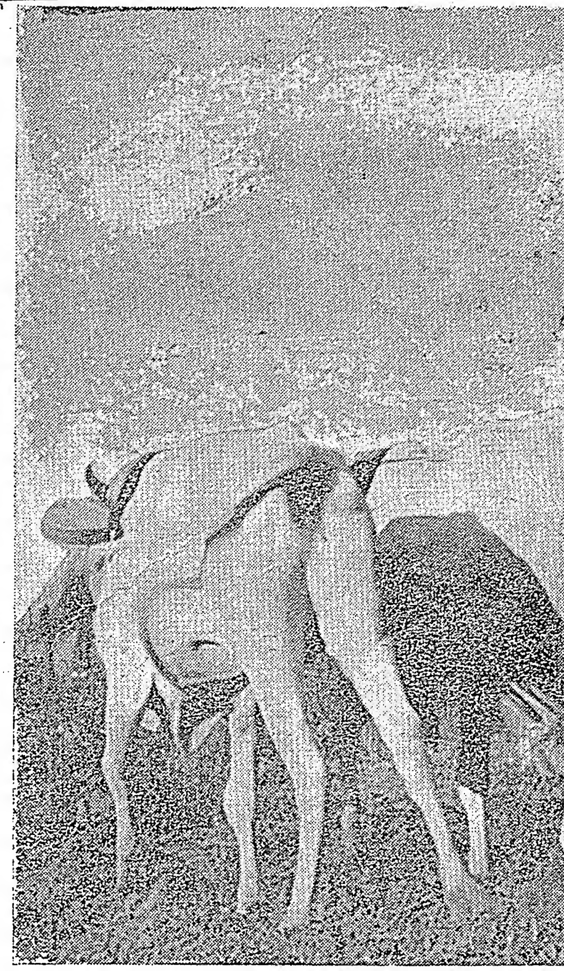
When the fruit is half mature the bunch is shaded by bending the banana leaves over it or it may be wrapped with dry banana leaves. This improves the colour of the fruits and saves them from hot winds and sun. Banana should be harvested when fully matured. This is shown by the drying of the pistil attached to the apex of the fruit and also by its edgeless shape. It is better to delay harvest till a few fruits from the topmost whorl start ripening on the tree. Cut off the bunch with as long a stalk as possible. After the bunch is removed the plant is dug out leaving the daughter sucker in the field. Fruits are ripened indoor in paddy straw, dry leaves or generally by smoking in a closed oven.

Yield obtained on one of the farms is given below:

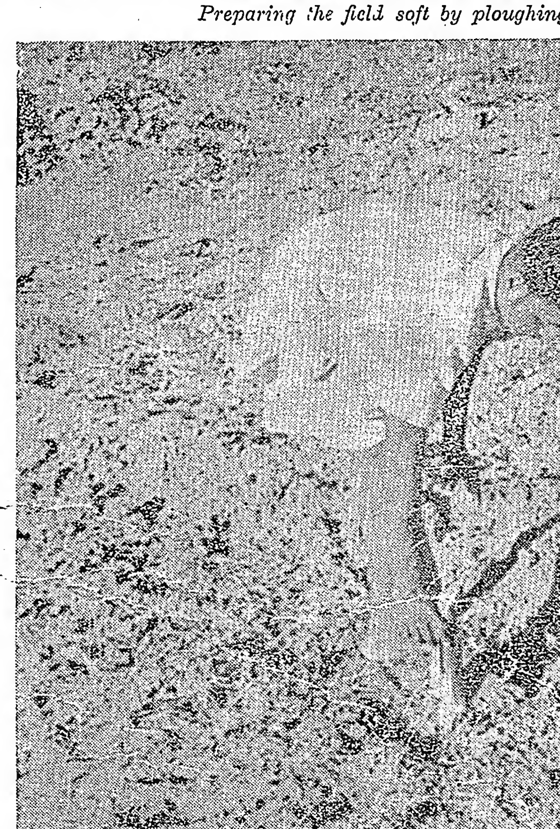
Number of trees planted	..	684
Number of trees in fruit	..	660
Total number of fruits	..	36,567
Average number of fruits per plant	..	56 (weight about 5 seers)
Outturn per acre is about	..	150 maunds.

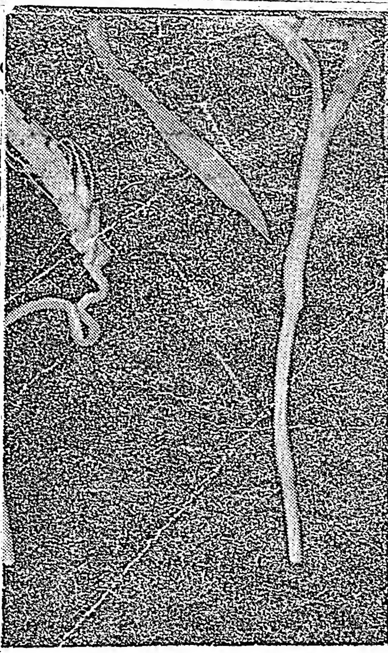
Flowering makes its appearance beautiful



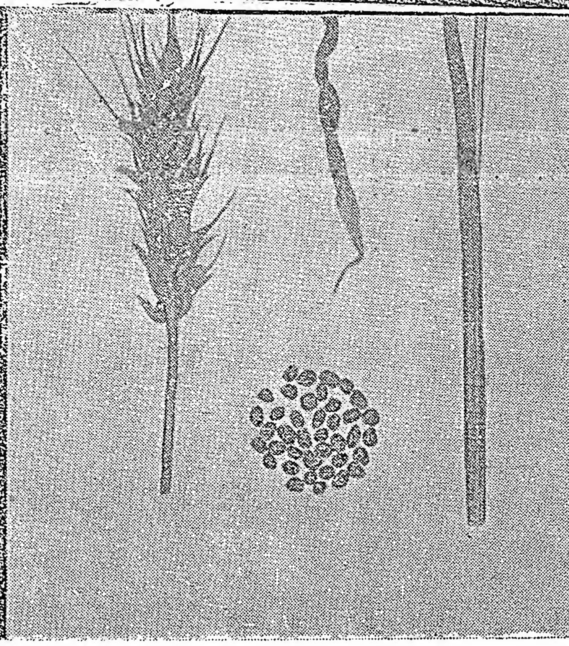


Preparing the field soft by ploughing





nnan or Tundu disease of wheat—distortion of the stem immediately below the head.



Tannan or Tundu disease of wheat—Hard, dark galls in place of normal kernels

TANNAN OR TUNDU DISEASE OF WHEAT

By

R. S. VASUDEVA & M. K. HINGORANI

Division of Mycology & Plant Pathology, Indian Agricultural Research Institute, New Delhi.

MOST of us are familiar with the fact that bacteria, visible only beneath our lenses and by special means, cause a number of harmful diseases among human beings and animals, e.g. cholera, tuberculosis, influenza, pneumonia and typhoid fever. Very few are, however, aware of the ravages they cause as plant parasites, especially in India. There are more than 200 such diseases spread all over the world on various kinds of plants and, one of these, locally known as Tannan or *Tundu*, affects our wheat crops. This trouble is particularly severe in Delhi State and in certain parts of the Punjab, Rajasthan and Uttar Pradesh. In Delhi State alone the damage can be safely put at about 1 to 2 per cent on an average, but losses exceeding 50 per cent have been observed in individual fields. As the affected ears fail to yield any grain, its appearance even in a mild form is responsible for considerable loss.

CHARACTERISTICS OF THE DISEASE

The principal characteristics of this disease are curling of the emerging leaves and the development of a bright yellow slime or gum on the inflorescence and parts of the stem, forming adherent sticky layers between the glumes and between the stem and the sheath. This slime is composed of bacterial mass and the the outer exposed portions become dried up, hard, and brittle, and at the same time take on a deeper yellow tone. Another common feature is the distortion of the stem immediately below the head, due to the interference of the sticky bacterial masses with the growth and expansion of the plant.

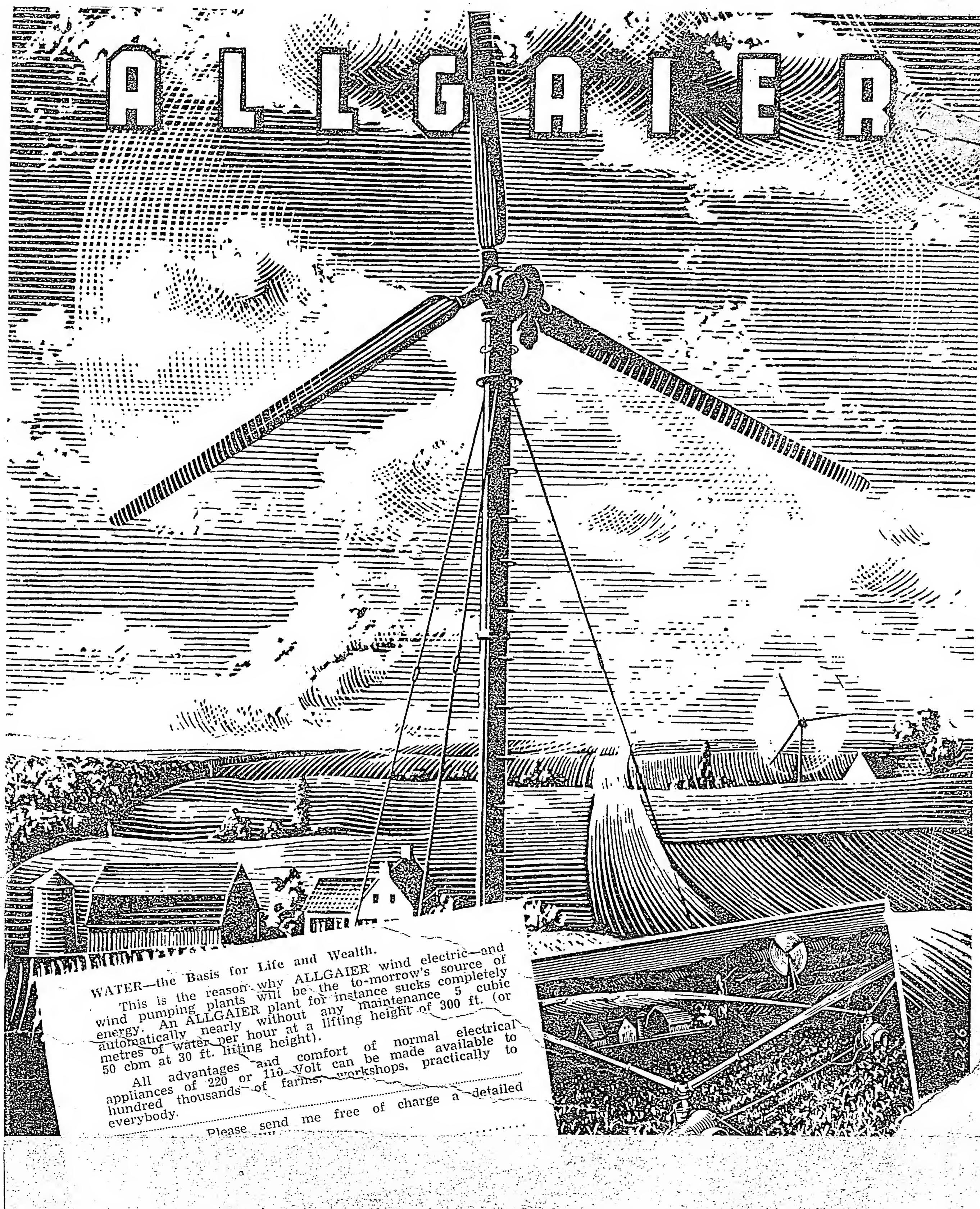
The cause of the disease is a bacterium (*Corynebacterium tritici*). These germs are, however, unable to attack wheat plants directly, but require the presence of eelworms known as nematodes (*Anguillulina tritici*). This peculiar worm causes another dreadful disease of wheat which is known as *Mamni, Dhanak, Gegla*, or Earcockle. In the seedling stage, the nematodes cause wrinkling, twisting and various other distortions of the leaves, and sometimes enlargement of the stem. Nematodes form small raised rounded areas or galls on the leaves. Infected plants are usually shorter and thicker than normal ones. Seedling severely infected with nematodes often wilt and die. In the mature heads of wheat, the disease is characterized by the presence of hard dark galls in place of normal kernels. The galls are somewhat thicker than wheat kernels and cause the glumes to spread apart as in bunt-infected head.

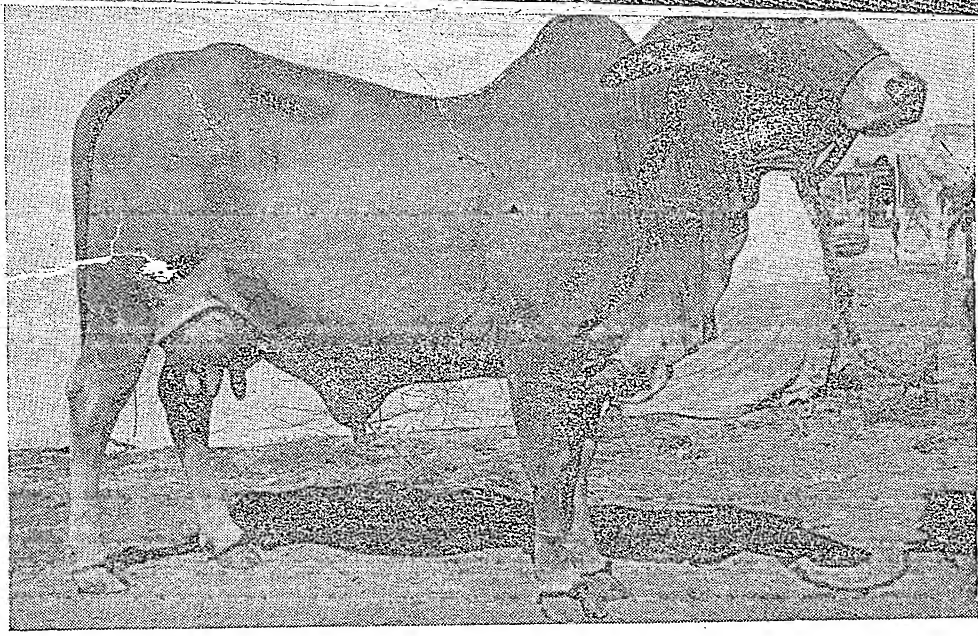
These galls or so-called cockles, because they resemble the seed of European Cockle weed, contain both the nematodes and the bacterium. When they fall to the ground or are sown with the wheat seed, the worms escape into the surrounding moist soil and, on coming in contact with the seedling shoots, penetrate between the leaf sheaths near the apical or growing point of the shoots. They also carry the bacterium which causes the disease. It is interesting to note that, where the disease occurs, all the affected plants do not show bacterial symptoms, but instead sufficient cockles are produced to begin the cycle over again in the next growing season.

FLOATING OF THE GALLS

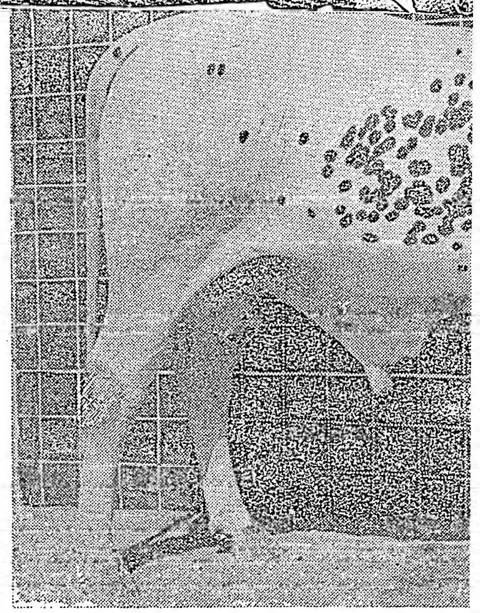
It is clear from this that the control of earcockle will ensure a simultaneous check of *tundu* disease. Among other things, our investigations have shown that a farmer can get rid of this menace within a couple of years by sowing clean wheat seed from which galls have been removed. This can be easily achieved by floating off the galls in water just before sowing. The galls are lighter than the kernels and, therefore, do not sink to the bottom. Some of them may stick to the seed, but majority of them can easily be removed if the water is continuously stirred for about fifteen minutes. This process is very simple and economical. The only apparatus required is an earthenware or a metallic vessel, large enough to handle about 25 seers of seed at a time, with a spout at the top to decant off water along with the galls

(*Continued on page 19*)

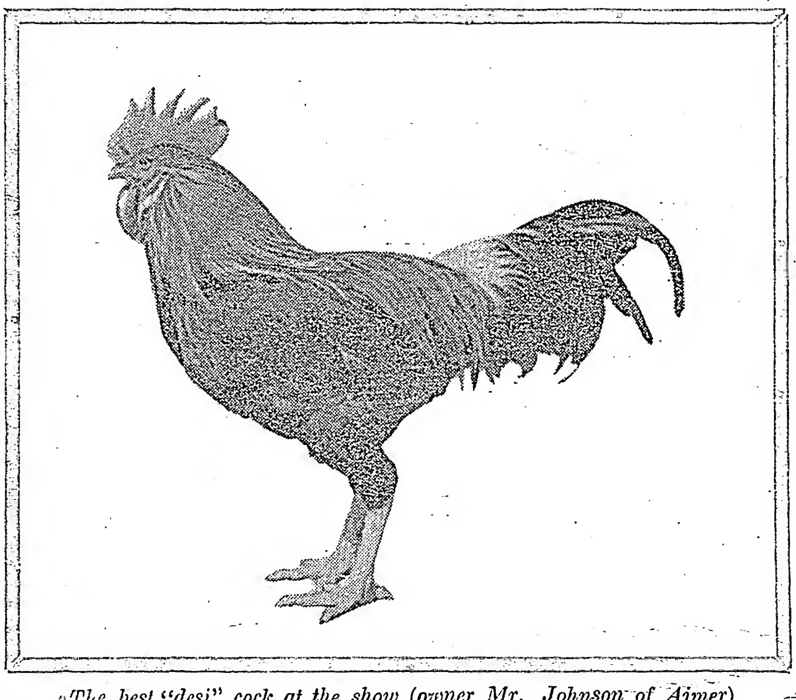

ALLGAIER



Sahiwal cow—highest milk yield. 1st prize goes to her—Owned by the Military Farm Dept.



The best anima[l] Deoni bull owned by Shri



The best "desi" cock at the show (owner Mr. Johnson of Ajmer)

Eleventh Cattl[e]

BLACK AND WHITE DEON[I]

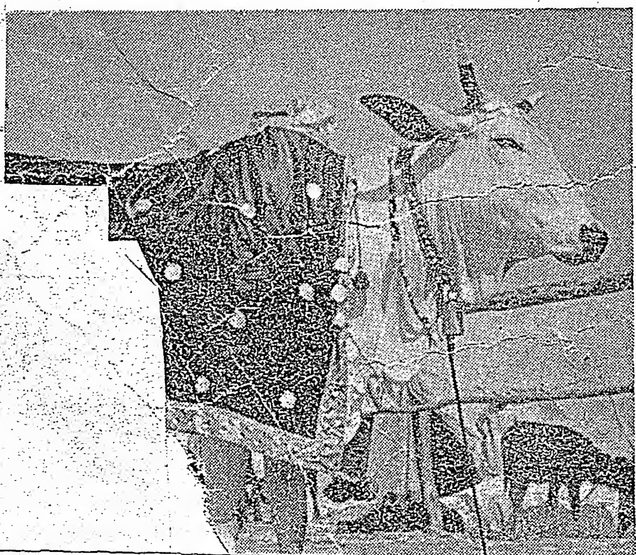
By S. L.

Ministry of Information a[nd]

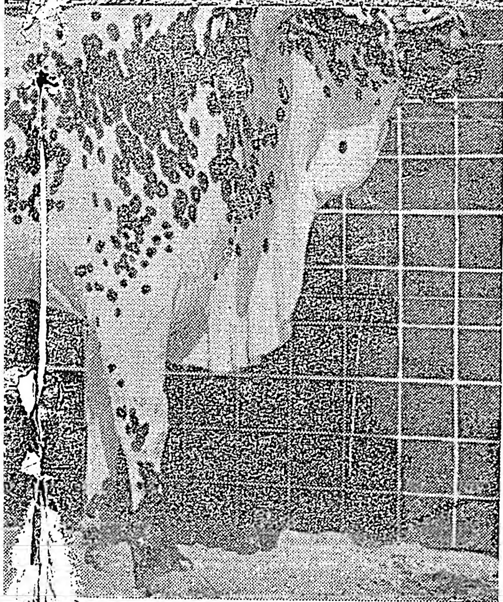
AFTER a lapse of two years, the All-India Cattle Show was again held this year in the Capital from February 22 to 27. In conjunction with this Show was also held the Eighth All-India Poultry Show. The venue of the Show was the picturesque Bella grounds near Rajghat by the banks of the Jumna. Entries totalled nearly 600. Seventeen out of the 34 recognised breeds of cattle in the country had been entered. Forty-four animals were entered in the sheep and goat sections.

POULTRY PARADE

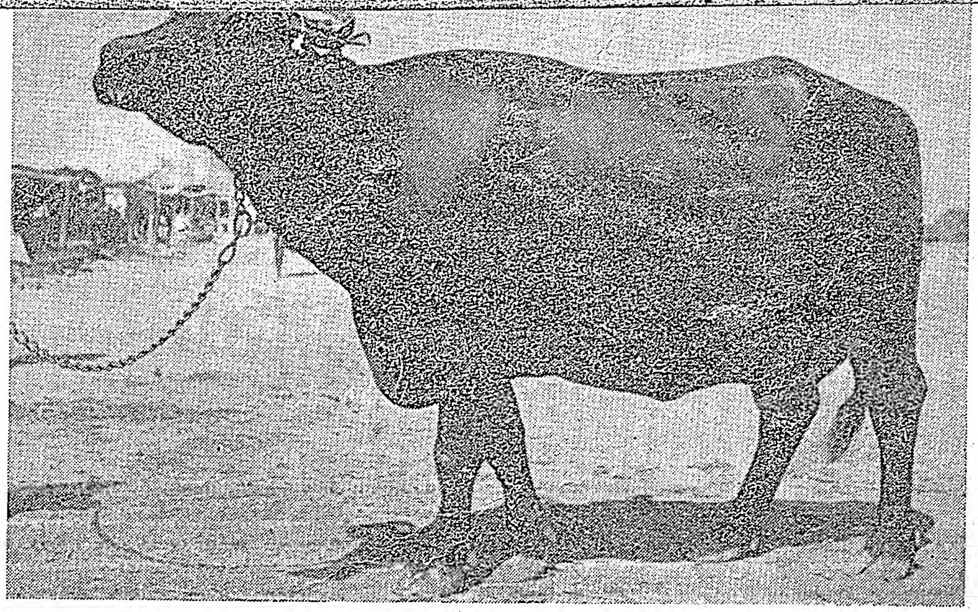
In the poultry section, 650 entries were received from the Punjab, U.P., Rajasthan, Ajmer-Merwara, Bombay, Madras, Delhi, Bihar as well as from military farms. In this section, foreign breeds acclamatised and bred in this country, like White Leghorns, Rhode Island Reds, Black Minorcas, Orpingtions and Australorps were also entered. There were many hardy Indian varieties to represent the country's poultry population of 58 million. An improved *deshi* strain, evolved at the Indian Veterinary Research Institute, and with a consistent laying performance of around 140 eggs was on view. Some interesting exhibits of the native *Aseels*, whose males are famous for their fighting qualities as game cocks, were also on show.



A decorated Hariana cow in the show



the show—
ukaram of Udgeri (Bidar)



The best buffalo bull in the cattle show

All-India
e Show

I BULL VOTED BEST ANIMAL

DHINGRA,
nd Broadcasting, New Delhi.

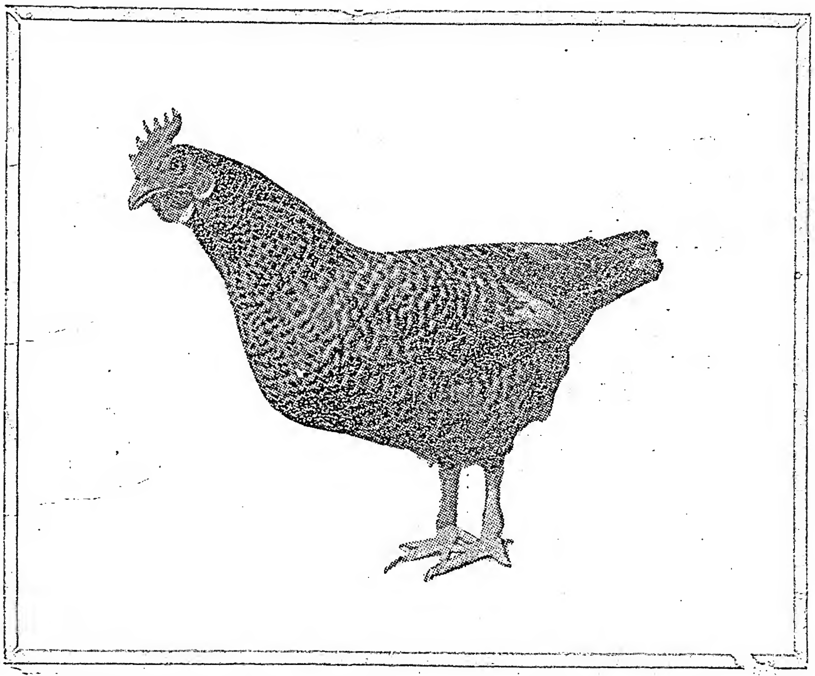
A noteworthy feature of the Show was the absence of foreign or hybrid breeds in the cattle section. This was due to the fact that it is the policy of the Government to encourage improvement of indigenous strains. Hybrid animals, according to experts, have been found to show the favourable qualities of both foreign and Indian strains in the initial stages but are prone to show the defects of both after some time and are not, therefore, suited to Indian conditions.

SCIENTIFIC BREEDING

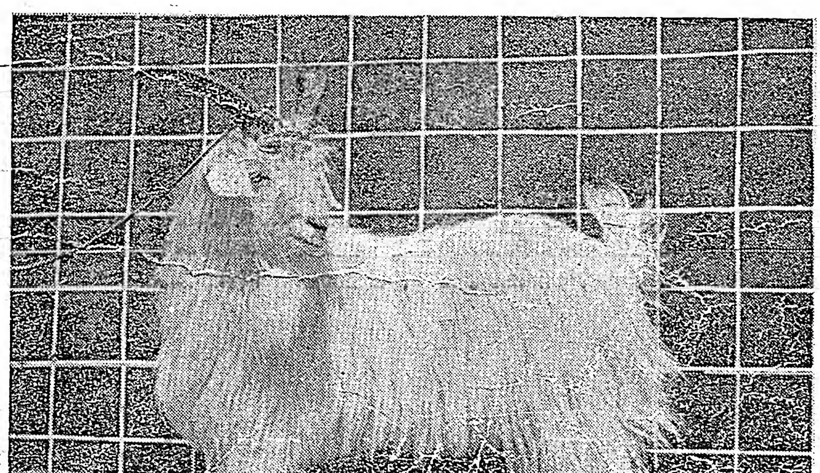
Declaring the Show open, Sri Prakasa, now Governor of Madras, stressed the need of an all round improvement and development of Indian cattle. "It may perhaps surprise you to know," he said "that we have only one breeding bull where 250 are required; and the amount of fodder available for them cannot maintain them in proper health and vigour. What we need is scientific breeding and feeding, controlling diseases and making proper arrangements for marketing."

PRIZES FOR CHAMPIONS

The central feature of the Show was of course the choosing of the champions. The Cattle Show awarded 81 cups, shields and other rewards of the value of about Rs. 65,000 and about Rs. 13,000 in cash prizes to the winners.



Best "desi" hen (aseel) *at the show* (*owner Shri S. A. P. Prasad, Madras*)



Ga

The best animal in the Show was a magnificent black and white mottled Deoni bull from Hyderabad with flowing lines. The proud owner of the animal, Mr. Tukaram of Godsur in Hyderabad, won five cups including the Marquess of Linlithgow's Challenge Cup for the best animal in the Show. He also got cash prizes totalling Rs. 3,100 of which Rs. 2,000 was given by the Indian Council of Agricultural Research for breeding the best head of cattle in the country.

An 8-year-old Sahiwal cow from the Military Farm at Meerut annexed the Sir Datar Singh Challenge Cup for the highest milk-yield. She also annexed the Zal R. Kothavalla shield for the highest milk-yielding animal in the Show. She gave 43 lbs. and 4 ozs. of milk in 24 hours.

A Murrah she-buffalo from the Mechanised State Farm at Meerut won the Sir Hormasji Cawasji Dinshaw Challenge Cup for the highest milk-yeilding buffalo. She yielded 40 lbs. and 11 ozs. in 24 hours.

BEST COW

Gulzar, a Sahiwal cow, bred by Satguru Maharaj Pratap Singh of Sirsa (Punjab), was judged as the best cow in the Show. She was also adjudged as the best cow in the country and was awarded the Indian Council of Agricultural Research prize of Rs. 1,000. Maharaj Pratap Singh who is one of the largest cattle breeders in the country won 14 trophies in the Show.

The prize for the best buffalo bull in the Show was annexed by Mr. Amarsingh of Amritsar and that for the best buffalo cow by Mr. Hoshiar Singh of Delhi.

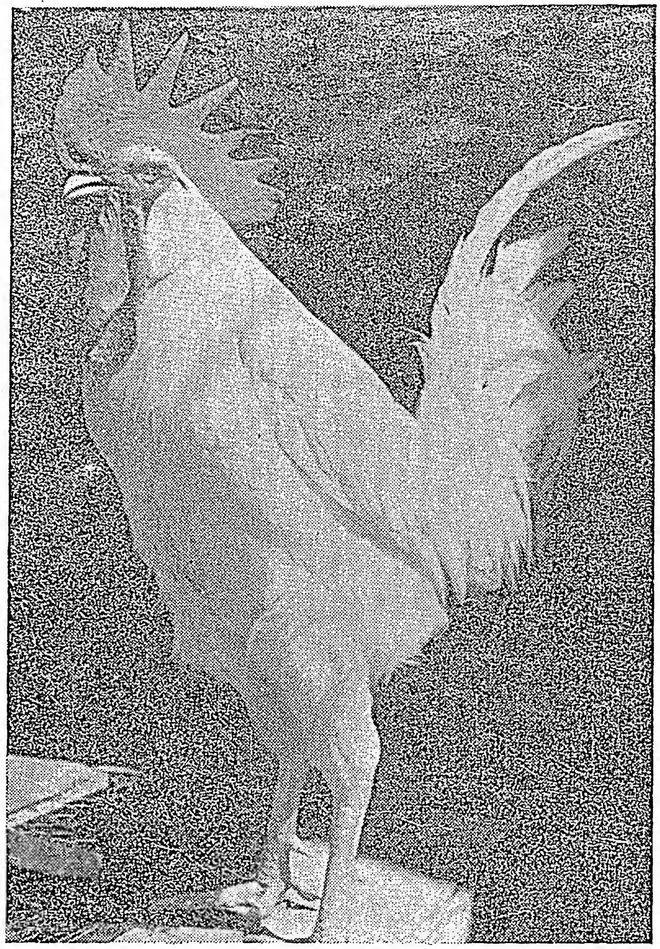
Distributing the prizes, Mr. K. M. Munshi said: "India's huge cattle population of 176 million cannot be developed unless people owning them take a vital interest in them. In Indian economy cattle and human beings are bound as an insoluble unit."

STRANGE PARADOXES

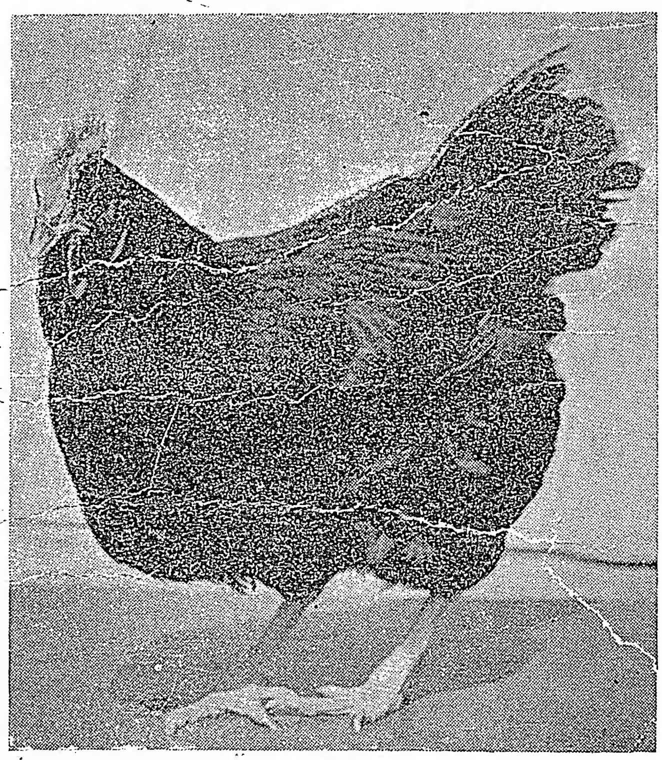
As in almost everything else, India presents strange paradoxes in the matter of her cattle wealth. Numerically, she possesses the largest number of cattle, almost one-fourth of the total cattle population of the world, yet there is a woeful shortage of cattle both for draught purposes and milk supply. Nowhere else is there so great a veneration for the cow as in India and nowhere else is the cow more neglected. Although everybody in India realises the value of milk, yet India's milk consumption is among the lowest in the world.

A MULTI-CRORE ASSET

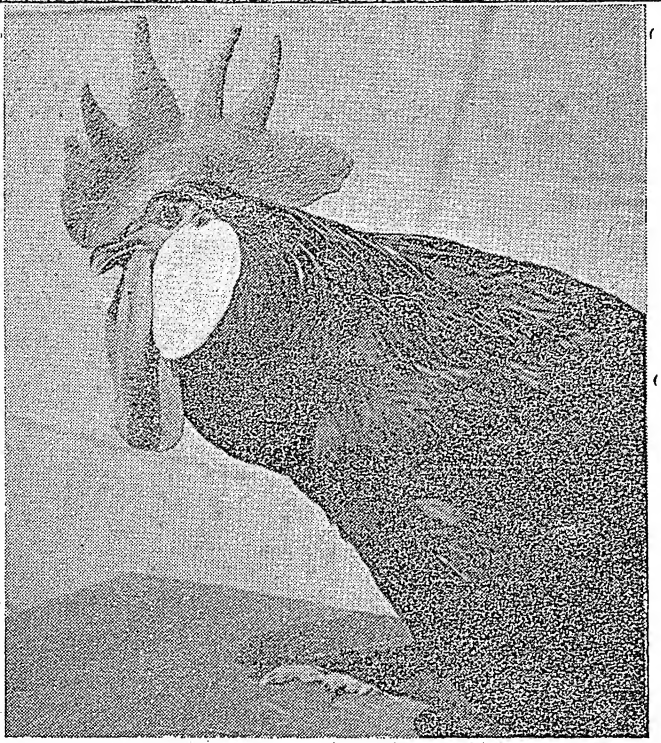
However, despite these paradoxes, the fact remains that cattle are a very important factor in India's economy. The bullocks supply power for tilling the land, for drawing water, for thrashing corn and for transport. The cow not only gives milk but is also the mother of the bullock. Cattle yield hides and manure. It is estimated that the value of hides and skins produced in India is about Rs. 40 crores. By providing transport for agricultural produce, it is estimated that cattle contribute approximately Rs. 161 crores, while by way of cattle labour for agriculture they contribute another Rs. 300 to 400 crores. The value of manure is estimated at about Rs. 270 crores. The latest estimate of the monetary value of Indian cattle is estimated at



A White Leghorn cock at the show



The best hen-Rhode Island Red group



Head study of a Black Minorcas cock at the show

Rs. 4,000 crores per annum. It is, therefore, not without significance that India has throughout ages worshipped the cow and that proper care of the cow is looked upon as a part of any constructive programme for the uplift of the people.

Since the attainment of Independence, the Government of India has been paying a very great deal of attention to the improvement of the cattle wealth of the country. Under the Five Year Plan, it is envisaged to produce about 60,000 pedigree stud bulls every year. Already about 100 Key Village centres are engaged in this task using all modern technique for this purpose.

CATTLE SHOWS IN THE PAST

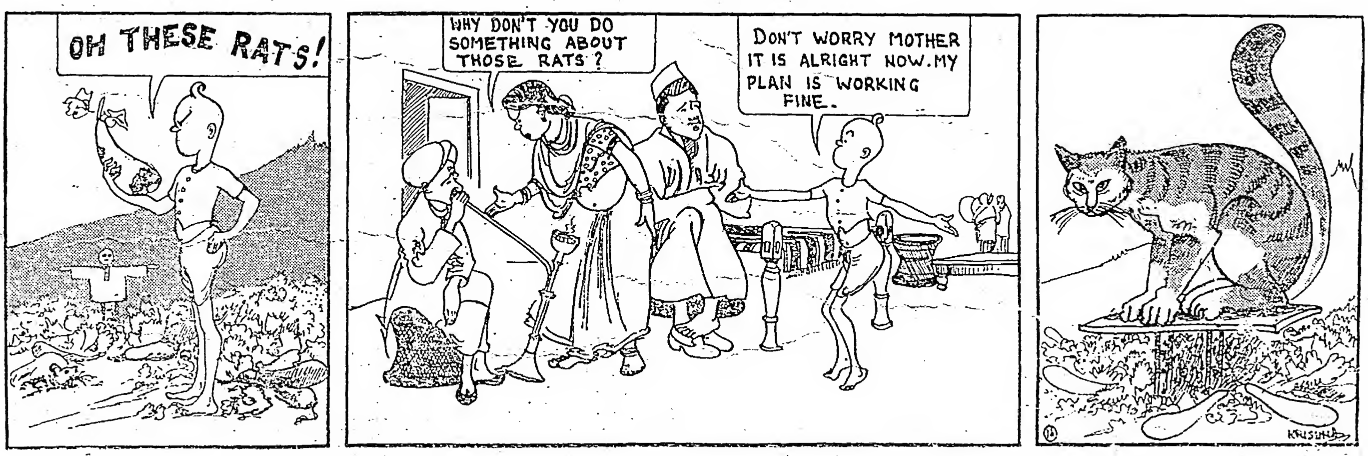
The All-India Cattle Show, by the specimens exhibited, gives an idea of the progress made in the improvement of the country's cattle breeds. The first Cattle Show was held in India in 1938. This was organised by the All-India Cattle Show Committee which was started in that year with the object of organising periodical shows in India and carrying on all activities connected therewith including the furtherance of cattle breeding and the improvement of stock. In his welcome speech on February 22, 1952, Sardar Datar Singh, Vice-President of the All-India Cattle Show Committee, said: 'The activities of the All-India Cattle Show Committee have gained a momentum which, if checked at this stage, would prove detrimental to the best interests of the cattle industry in the country.'

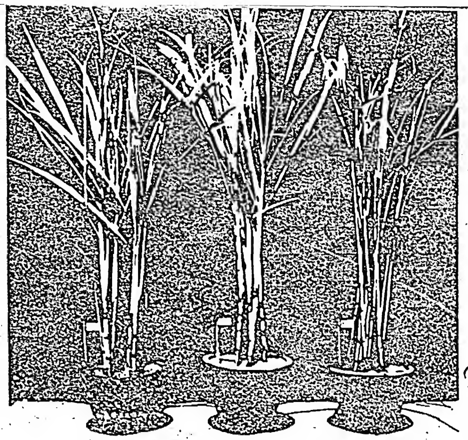
Cattle Shows are now universally recognised as the most important feature of cattle development programmes. It is an established fact that a breed is formed in a judging ring. The competitions held in various classes on an All-India basis create a healthy spirit of competition and induce breeders to produce better animals. They also afford unique opportunity to breeders not only from India but from other countries also to witness at a central place the choicest collection of the best-known breeds of the country. The aim of course is that the All-India Cattle Show should be closely linked up with the shows held in States so that winners in village shows should be exhibited in Tehsil or Taluk Shows, winners therefrom in District and State Shows, the ultimate winners competing at the All-India Cattle Show. The All-India Cattle Show is, therefore, aimed to be an apex of a number of cattle shows organised all over the country.

TANNAN OR TUNDU DISEASE OF WHEAT

(*Continued from page 14*)

into another vessel. The treatment should be done on the same day when the sowing is to be done and the seed sown after partial drying. This will not in any way adversely affect the germination of seed. One precaution is, however, very essential. The galls so collected should not be thrown near the cultivated areas, but should be burnt immediately to avoid them being a source of infection in the subsequent season.





1 2 3

1. *Co. 421*
2. *Thick (Like Mother)*
3. *Thin*
4. *Widely differing daughter plants derived from mother Co. 421 without the help of a father*

HOW BETTER CANES ARE BRED AT COIMBATORE

By

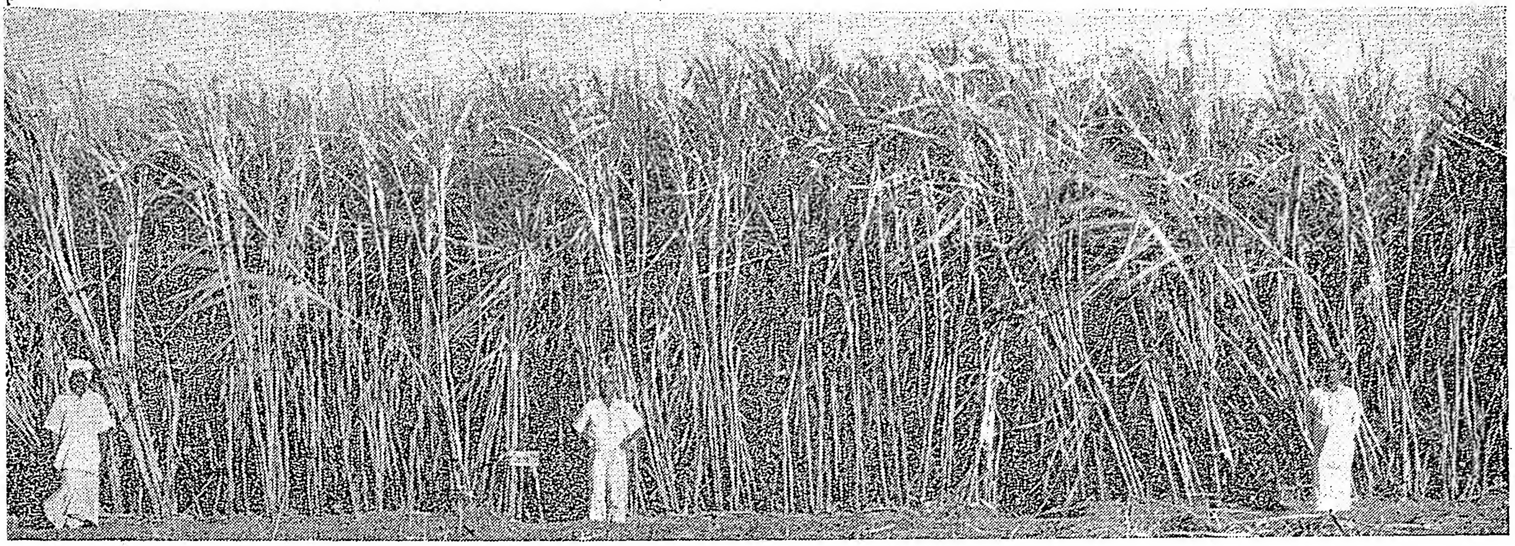
DR. T. S. RAGHAVAN,

Sugarcane Breeding Institute, Coimbatore.

SUGAR can be manufactured from sugarcane, sugar beet, coconut, palmyra and date and certain other palms. Sugarcane and beet are however, the principal sources. The total production of sugar in the whole world is of the order of 34 million tons of which about 2/3rd is cane sugar. Sugar beet is confined principally to the temperate regions, especially of Europe. Sugarcane is spread over the tropics and sub-tropics of both eastern and western hemispheres.

In the breeding of better canes in Coimbatore, great emphasis has been laid on the utilisation of wild *spontaneum*. The production of the famous seedling, Co. 205, a direct cross between *officinarum* and *spontaneum*, opened up great possibilities as is now well known, in the establishment of a sound sugar industry in north India. Its hardiness and disease resistance have conferred on the hybrids a vigour which is almost unparalleled. However, the juice quality is somewhat inferior in the hybrids because of the poor juice quality of *spontaneum*. For improving the juice quality more of *officinarum* blood is introduced through further crossings with the 'noble' canes. With a view to utilising a wider range of genetic stocks, collection of *Spontaneums* from the different parts of the sub-continent are being made and by utilising these, it is hoped to introduce such desirable characters as are expected to withstand waterlogging, resistance to salinity and high winds and diseases and pests. Every year hundreds of thousands of seedlings are raised by a number of crosses amongst parental forms which are built up year after year. Because of the unpredictability of hybridisation results referred to above, the greater the number of crosses and wider the range of variation, the greater also are the chances of resulting forms with desired combinations. These hybrid seedlings which are raised in pans are transferred to the first ground nursery after the third month and from there to the second ground nursery after another three months and from the second ground nursery canes are selected on the basis of their vigour, sugar content, early or late maturing habit, etc. They are transferred to the one-row trial plot. Further selections from these are taken on to the final test plot where they undergo replicated trials. From the lakhs of seedlings that are raised through hybridisation, by the time they reach the final test plot, their number gets filtered down to less than a hundred and the time interval involved is about 3½ years. About 50 of these canes from the final test plots are finally selected and are raised to the status of Co. canes for distribution to the State testing stations for further trials. Data are collected in such a way as to throw light on the earliness or lateness of maturity, tonnage and sucrose. The best method is to grow early, mid and late in such a way as to spread the crushing season for as long a time as possible. Bombay is particularly interested in the late varieties because of the practice of *adsali* cultivation in those tracts. In the northern districts of the Madras State, the problem is cyclonic winds. We must breed a cane which is short and bushy. A cane like Co. 419 which is tall and brittle is liable to snap on account of these high velocity winds to which those parts are subjected very frequently. In breeding for their needs we have to keep in mind a short spreading type of parent which, even though they may not contain enough sugar may be selected to impart this desirable character to another parent having enough sucrose. Similarly for the north Indian tracts quick-growing and early maturing canes are needed. So the work of the sugarcane breeding at this Institute is conducted in such a way as to be adapted to the needs of the different tracts of the country. After these selected Co. canes reach the State testing stations, they are multiplied and tested for a further period. The idea of sending these selected canes all over India is to enable the different testing stations to select canes suited to their tracts; a universal cane to suit the widely differing conditions of the whole of India is almost an impossibility.

Java, Hawaii, Formosa, Cuba and West Indies had superior natural resources and were able to produce a large exportable surplus. The total world area under sugarcane is very nearly 12 million acres of which about a third is contributed by India. Sugarcane forms in India about 2 per cent of its total cultivated area of about 200 million acres. In India, Uttar Pradesh has the highest acreage having more than half the total for the whole country. Next comes Bihar. Madras has a tenth of Uttar Pradesh's acreage. But the total production of cane is very nearly one fourth of that of Uttar Pradesh. In the sub-tropical north the canes are thin and botanically come under the group *Saccharum Barberi*, while the canes of tropical India are thick and noble and belong to the species, *Saccharum offici-*



At Kunyamuthur—standing crop of Co. 419 which yielded over 90 tons per acre

narum. Nearly 80 per cent of the cane area in India is sub-tropical in its distribution. The average yield of canes for the whole country works out to only about 14 tons and consequently the total production of sugar in India is not commensurate with its area. For if that were so we should produce more than a third of the world sugar, i.e. very nearly 8 million tons. But the production in India in terms of *gur* is of the order of less than 5 million tons. Of this total, sugar forms but a million tons. A fact worth remembering in this connection is that out of an approximate total output of 53 million tons of canes only 22 per cent find their way into factories, 55 per cent are used for *gur* manufacture. The rest are used for planting, chewing, Khandsari, etc. The thin north Indian canes which are mainly responsible for this low yield of canes and consequently of sugar, are not to blame either, because situated as they are in the sub-tropical belt of the country, their growth period is limited to the interval between the summer and the winter. When grown under proper conditions they have given yields of over 70 tons.

'Noble' canes thrive better in the tropics, because of the absence of extremes of temperature and they grow almost throughout the year. Hence their higher yield. In a prize competition organised by the Deccan Sugar Technologists' Association, a record yield of 122.4 tons was obtained with Co. 419 which is the variety *par excellence* for tropical India. This is only a little short of the world record of 129.1 tons in Mexico and 126.8 tons in Hawaii. At Kuniyamuthur, very near Coimbatore, a yield of over 90 tons has been obtained with the same variety.

The aim of the sugarcane breeder is to increase the production of sugar by improving the quality of the canes grown in this country. Hybridisation is the tool which has been in the hands of the plant breeder from time immemorial, the object being to combine the desirable characters of the two parents that are crossed. One has to remember that each plant or animal is, as it were, a dual structure made up of both maternal and paternal material brought together during fertilisation. Therefore a complete reshuffling of parental characters must be expected in a sexually derived progeny. Consequently the offspring resulting from the union of sexual cells will show a wide range of variations. In individuals coming into being from the same parent, i.e. selfed progeny, these variations are not so marked and in cases in which this self-fertilisation is the rule, the resulting progeny is almost uniform. But in a plant like sugarcane in which cross fertilisation is the rule, one may expect to find marked differences amongst the individuals obtained by the sexual process. If it were like any other plant, the breeding of sugarcane will follow the usual procedure, namely crossing of individuals possessing the characters whose combination we want and repeated selection through several generations until we get a pure line breeding true to a particular combination of characters. This, however, is impossible in sugarcane because of various factors; the chief of these is that in the evolution of the sugarcane two or more ancestral forms have contributed. So in sugarcane hybrids the parental characters are found distributed in an unpredictable manner. But because of vegetative propagation any suitable form that comes into being through hybridisation can at once be fixed and multiplied. This, however, would not be possible if the plant is propagated only through seeds. Several sugarcane varieties have no pollen of their own mainly because the sacs containing the pollen grains do not open at all. From many such forms daughter individuals are known to arise even though we exclude foreign pollen. It means that the daughter plant has come into being from the unfertilised egg. The mechanism of this parthenogenetic development is so peculiar in sugarcane that such derivatives show variations amongst themselves and are not uniform as they should be. The result of all this is that there is a large element of chance so far as hybridisation work in sugarcane is concerned. The characters are found distributed in an unpredictable manner in the progeny of a cross making it almost impossible to resynthesise a particular combination of characters. For instance Co. 419 which is a cross between POJ. 2878 × Co. 290 cannot be got back again by repeating the cross. The chances are very remote.

The farmers learn the way of washing the fibre clean

GLOSS OF THE GOLDEN FIBRE

By
A. K. MUKHERJEE,
Publicity Officer, Indian
Central Jute Committee.

JUTE is aptly called the 'Golden Fibre' as much for the 'gold' it fetches to the grower as for the glittering gloss of the fibre itself. Indeed, the latter determines to a large extent the preference of the foreign markets for this comparatively cheap Indian packing material. From the green bark of the plant to the bright flowing jute fibre is, however, a transformation that involves several important stages which by themselves determine to a large extent the colour of the fibre. Genetically, the two principal varieties of the Corchorus stock, *Corchorus capsularis* and *Corchorus olitorius*, have two distinct but broad colour specifications. The fibre from the first, *Corchorus capsularis*, has the trade name 'white jute' while that of the latter, *Corchorus olitorius*, is commonly known as 'red jute'. The exact colour of the fibre, within the limits of these broad classifications, is, however determined by the actual process of, and the conditions in which, the bark is extracted from the stock and converted into fibre. The so-called white jute, for instance, may vary in colour from white to cream or to dark grey and the red jute from golden yellow to slaty brown, red or dark grey. The exact shade of the colour is largely dependent on the process of retting.

A MAJOR PROBLEM

Retting is one of the major problems that cropped up in our jute economy as a result of partition. East Bengal is a land of rivers and canals that flow into the remotest interior of the region. Nature has thus provided this luxuriant jute belt of the world with adequate facilities for retting. Not only that. The clear water of the Brahamaputra and its tributaries that irrigate this region, offer the most suitable medium of retting which imparts to the fibre its natural colour. In contrast, the waters of the Ganges and its tributaries, particularly in their lower reaches, are muddy, and retting in this turbid water makes the colour of the fibre grey or yellowish brown. Even this muddy flowing water is not available in the interior regions of West Bengal or North Bengal, where the principal retting media are stagnant pools which further deteriorate the colour of the fibre.

Jute growers are taking a lesson on retting. They are being instructed to separate bark from jute stock.

With the jute self-sufficiency drive nearing its target from year to year, the problem of retting is becoming acute in the Indian Union. In the last four years the jute yield of the Indian Union has increased by more than 200 per cent creating the tremendous problem of extracting the fibre in a way that will retain its natural gloss and thus help upkeep the foreigner's preference for its products. In view of the natural handicaps, such as lack of riverine flooding of pools and tanks in the interior of the jute areas of the Indian Union, the question of retting presents almost a baffling problem for the jute grower.

Retting in natural water has received serious attention of the Central as well as the State Governments. Special grants were allocated to finance excavation of retting tanks and the local authorities were urged upon to make available to the jute grower road-side pools and tanks and all possible rural water storages not otherwise useful. Even so, the problem remains as serious as before.

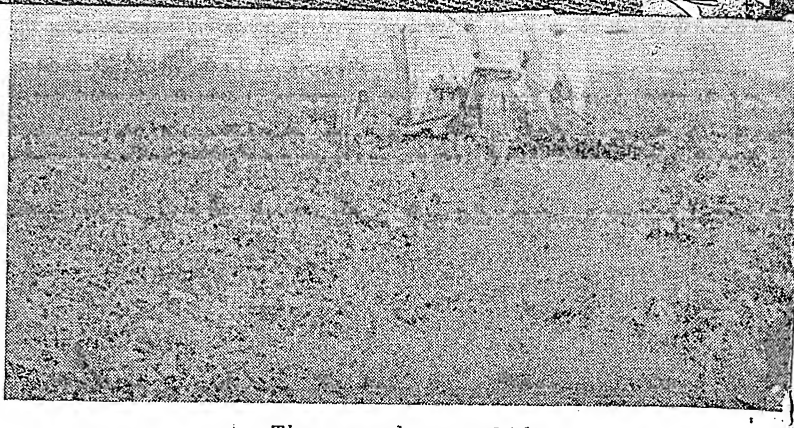
Simultaneously with the measures to extend the natural retting facilities, investigation has been conducted to find out whether by the use of suitable chemicals in the retting tanks, the period of steeping may be reduced so that each retting tank may be used for the purpose more than once. Incidentally, the chemical changes in the retting tank's water were kept constantly under review, so that any deficiency due to the process of retting might be made good at short notice. Experiments were conducted at the Jute Agricultural Research Institute of the Indian Central Jute Committee with (*i*) water from Hooghly as medium; (*ii*) tap water as medium and (*iii*) retting water obtained from Chinsurah Farm as medium. A variety of chemicals was used. The investigation still continues. Meanwhile, it has been observed that the addition of bone dust to water has invariably lowered the duration of retting in all cases to the maximum of 30 per cent or so of controls.

Biochemical investigations of the process involved in the retting of jute are being conducted under the auspices of the Committee. Subject to further verification, these investigations have shown that the application of the active culture obtained from the decomposing fruits of Putranjiba Roxburghii (wall) has important effects on the retting process. The feasibility of utilising this culture in the indigenous process of retting jute is being studied.

CHEMICAL RETTING

The question of chemical retting of the jute fibre has not been left out of consideration. The Technological Research Laboratories of the I. C. J. C. have as a result of small scale experiments found that "of the various chemicals tried, ammonium oxalate, sodium fluoride and sodium silicate were most suitable for the purpose". "The fibre received from chemical retting was tested and compared with a similar fibre obtained by ordinary retting from similar plants grown on the same plot. There was no remarkable difference, however, though the chemically retted fibre was somewhat stronger. Both were very uniform and free from bark".

A comfortable harvester for the cowpeas



The reaper does a good job

COWPEA AND IT'S PLACE IN AGRICULTURE

By Y. C. GUPTA,
Agricultural Officer, Cattle-Cum-Dairy Farm, Karnal, Punjab.

COWPEA can be put to various uses in the field of agriculture. Primarily, it is given to cattle as green fodder and the seed extract at harvest—grain and green pods—is found fit for human consumption. The secondary uses to which it is put are (*a*) as a green manure crop (*b*) a substitute for grain in cattle feed.

COWPEA AS GREEN FODDER

Cattle relish the cowpea as green fodder in Kharif as they do berseem during Rabi. The crop is harvested for fodder when the flowers first appear and the plants are green and succulent. It is sown either singly or along with sorghum or maize. The advantage of this mixture crop is that the yield is increased and soil fertility is maintained. The seeds are scattered in a field that has been given 2-3 ploughings. Ten to fifteen seers are showered per acre, the yield being 150-200 md. of green fodder.

Cowpea has beaten all other Kharif fodder crops in increasing milk production of the milch herd. When administered along with maize, it achieves amazing results. It can cover the shortage of fodder experienced during the months of April, May and December. For, on conversion to silage, the mixture crop composed of cowpea and maize or sorghum, endures without spoilage for about ten years. To obtain silage the green material is chopped and ensiled. Six weeks later it is ready for use.

RAISING COWPEA

When the crop is sown with the purpose of obtaining seed, it is arranged in lines 2½ ft. apart. During the early stages 2-3 bullock hoeings are given. The seed rate is less than that for fodder, being 5-8 sr. per acre.

The pods begin to ripen four months after sowing. A few take longer than the others and hence several pickings have to be made. If all are picked at the same time the pods ripening first shed their grain in the field. It should be seen to that the soil has enough moisture in the early stages of flowering and pod formation. On sowing, too, 4-5 irrigations are necessary if the monsoon is late. Ideal soil is clayey black and red loams, light, sandy soil and alluvial plains. Heavy, clayey soil and water-logged areas do not bear good crop. It is sown during the months of June and July and people in different parts of India have styled it differently—*lobia, ravan, barbatti, chavali, babbarlu.*

A reaper may be used for harvesting. When the reaper moves the cutting bar works in between the fingers and cuts all the crop lodged in the space between them. The harvested material finds its way on to the attached platform and is periodically pushed, with the help of a bamboo, on to the ground behind where it accumulates in heaps.

Another view of how a reaper works on cowpeas

THRESHING THE HARVEST

The harvest is carted to a *pukka* floor and threshed. This is not done on the field, for the leaves will

(*Continued on page 27*)

CULTIVATION OF PAPAYA

By JADO NATH, Farm Manager, Sindri Fertilizers & Chemicals Ltd.

THIS plant and its fruits are commonly known as Papita in this country. The fruits are very popular among all classes of people.

The cultivation of Papaya was begun with the starting of an Agricultural farm at Sindri. Because of its early fruiting and the heavy yielding, the demand for both the fruits and plants increased. In a small 12-acre Agricultural Farm at Sindri, mainly meant for growing vegetables to supplement the demands of the employees of the factory, an experiment was made with the plantation of one hundred papaya plants to know whether it could flourish in this arid and sub-mountaineous tract. Growth in the first year was quite favourable and on maturity of fruits it was concluded that the cultivation of this useful plant could be undertaken with advantage. Its cultivation was therefore started on intensive scale.

HABIT

It is a beautiful shrub rather than a tree usually on a single straight stem with palm like leaves at the top, which are distributed uniformly. It requires a moderately rich well drained soil and is very sensitive to water-logging. It cannot be grown successfully on hills beyond an elevation of 4,000 feet above sea level. Its growth is also adversely affected by frost. Severe hot weather and heavy rainfall are both detrimental to its growth. Strong hot wind is also harmful. It would be advisable to grow some kind of wind break crop around a papaya orchard, as the stem is usually weak and fibrous. The plants in the kitchen gardens may also be put into such position as to derive maximum natural protection against strong winds. In general a temperature of near about 60°F. in winter and 100°F. in summer is helpful to its growth. It can grow to a height of 10-20 ft., but the smaller the height, the better it is as taller plants are more susceptible to strong winds.

TYPES

main types of plants. *male* : These produce long hanging clusters of white or yellowish white flowers, which usually do not bear fruits and should be removed as soon as found.

(2) *The female :* These produce long yellow flowers with very short stalks. These can be easily recognised by a globular ovary in the centre. As the female flowers do not usually set fruits without pollination, it is essential to keep one male plant for every 25-30 female plants.

VARIETIES

There are no fixed varieties of papaya. However for convenience the following varieties have been named and are commonly found: (*i*) RANCHI (*ii*) WASHINGTON and (*iii*) CEYLON.

SOWING

Papaya plants can be propagated by cuttings and in arching, but the method of sowing seeds in nursery has been found to be the best. The seeds may be collected from selected fruits which should be well formed, fair sized, sweet and borne on healthy trees. The seeds may preferably be selected from longish fruits. The seeds are sown in nursery in the month of March and germinate in 10-12 days. The seeds sown may either be fresh or dried and kept in well corked bottles. As soon as seeds germinate, they may be exposed to morning sunshine and covered in the later part of the day. The beds made for this purpose may be well raised so as to avoid water-logging. If sown in seed boxes, these also may be well drained. The seeds may be sown at least 2 inches apart and lightly covered with fine earth. The seed beds may be kept somewhat moist and regularly watered with a fine hose. The seedlings from these beds may be transferred to bigger-sized beds when the third leaf appears; at this stage the plants may be placed one foot apart. These beds should also be well prepared with a good amount of farm-yard manure. The plants would be ready for transplantation into their permanent quarters at the commencement of rains.

DIGGING OF PITS

The pits may be of 3 ft. × 3 ft. × 3 ft. dimensions and 8-10 feet apart. These may be filled up with good soil mixed with well-rotted cowdung. Usually 2-3 baskets of manure are added to each pit, in addition to one pound of oilseed cake and a handful of lime. These constituents may be thoroughly mixed before transplantation. As the papayas are transplanted in the month of July, the process of digging of pits should be completed in the month of May, so that the manure added may be well-mixed with the soil before transplantation.

TRANSPLANTATION

While transplanting care should be taken not to injure the roots. The soil ball surrounding the roots should be big enough so that the roots are not exposed. The seedlings with the ball of soil may be gently pressed with the soil from the pit while transplanting so as to bring both the soils into intimate contact with each other. The pits should be moist at this time and not too wet.

WATERING

The amount of water to be added to the plants depends on the weather conditions and the age of the plants. In general the pits should be kept in a moist condition. In summer the plants naturally require greater amount of moisture. In case of orchards number of irrigations depends upon weather conditions. In the case of small kitchen gardens it is preferable to add two buckets of water during a day, preferably either in the early morning or in the afternoon. Over-watering also results in shedding of flowers and should be avoided.

To check the growth of weeds, conserve moisture and aerate the soil. It is necessary to hoe the plants as often as possible. The process may be discontinued during the formation of flowers.

Manure may be added to the plants twice a year once in the month of June and then in October at the rate of one basket of well-rotted cow-

dung per plant. It may be advantageously supplemented with one-half pound of oilseed cake and one-quarter pound ammonium sulphate. The manure may be spread over the base of the plant and then thoroughly mixed with the top 4-6 inches of soil.

LIFE

The average life of a papaya tree is about 8 years and in favourable conditions it may go upto 10 years. The first three years are the most productive period and thereafter productivity goes on declining every year. The sweetness of the fruit is also reduced. Hence when grown on commercial scale the orchard may be renewed after every three years. In case of kitchen garden also, this principle may be kept in view. The old trees may be renewed in rotation so that a continuous crop is available. The tree usually comes into bearing after a year's growth. The average yield of a good healthy tree is in the neighbourhood of 15-20 fruits, weighing $1\frac{1}{2}$ to 2 seers each, although at Sindri with the method of cultivation mentioned above we frequently had fruits weighing about $2\frac{1}{2}$ to 4 seers each, a total yield of one maund per plant in a year.

In order to obtain fruits of good quality and uniform size it is advisable to thin out the fruits in the early stage. It is also recommended to allow at the most 15-18 fruits on each plant.

It is not advisable to pluck fruits in an unripe condition and then allow them to ripen in storage. This results in the loss of flavour and taste. The right time for the fruits to be plucked is when it has just developed some yellow spots. It may then be plucked carefully with hand and then stored in a dry place covered in a gunny bag or straw. It is recommended to keep the fruits in a single layer.

If carefully packed the fruit can stand a long journey and remain fresh for a number of days. We have been successfully despatching consignments to Delhi and Amritsar and have found the fruits in good condition at the destination. Care may be taken in selection of fruits to be despatched out. These fruits should have just developed yellow spots on the skin. Quite unripe fruits should not be chosen for this Ordinary bamboos or cane baskets are useful for packing purposes. A bedding of straw may be spread within the basket and also in between the layers of fruits. The layers of fruits should not be more than three in a basket. The large sized fruits may be placed in the lowest layer and the smaller sized and lighter on the upper layers. The basket may be covered with a gunny and stitched.

DISEASES OF PAPAYA

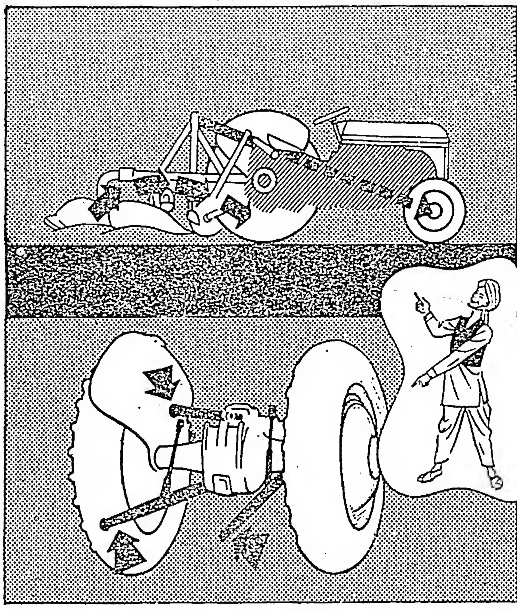
1. *Stem rot:* The disease occurs on account of excessive watering, and causes the stem to rot and decay. It can be remedied by the application of 4-5% of lysol solution.
2. *Leaf rot:* The leaves and the plants take on a curved shape and droop down. This is a contagious disease and should be immediately attended to. The best remedy lies in removal of affected plants and burning them away.
3. *Fruit fall:* In ill-drained and unhealthy conditions, rooting of stem and leaves is generally seen, which subsequently results in fall of fruits and flowers. In these circumstances proper drainage is the only cheapest remedy. In some cases spraying with Burgandi mixture is recommended.

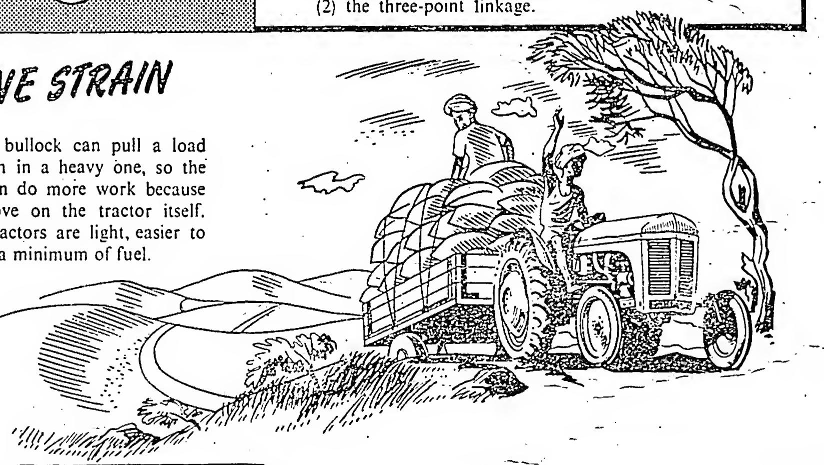
COWPEA AND ITS PLACE IN AGRICULTURE

(*Continued from page 24*)

dry and scatter. On the *pukka*, nothing is wasted. The method of threshing is to spread the material and give it a few turnings so as to render it dry. There is danger of the harvest becoming black and mouldy if any moisture is left over in the stems or leaves. It is very necessary, therefore, that all of the cowpea be entirely dry and free from moisture before storing. In the early hours of the morning, to prevent further shedding, the cowpea hay is carted and stored in dry sheds. It is preserved from rains and other damaging elements until it is needed.

Hence, the cowpea can go a long way in alleviating situations caused by fodder shortage. When preserved in the form of silage and hay it





WOMEN AND  CHILDREN'S PAGE

FIRST AID AT HOME

Children often develop minor complaints which, though not serious, should be recognized and dealt with properly. Although it is better to call a doctor when in doubt of the seriousness of a case, it is still better to be able to recognize and have a little knowledge of elementary ailments.

Choking: One of the most common and yet most alarming of these, is choking. Children, especially the very young, love to put things in their mouths, and from there it is only a short step to the windpipe and to obstructing the passage of air to the lungs. Or the cause may be a piece of food that has gone down the wrong way. But whatever it is, take measures immediately. A very young child may be lifted by the toes and held upside down for a few seconds. An older child should have his head bent down between his knees, and be struck on the back between the shoulders, smartly but not too violently. If these methods fail to work, put two fingers down the child's throat and try to dislodge the object. This will at least force the child to vomit and cough, which will be very likely to remove the obstruction. If this still fails to work, send for a doctor immediately.

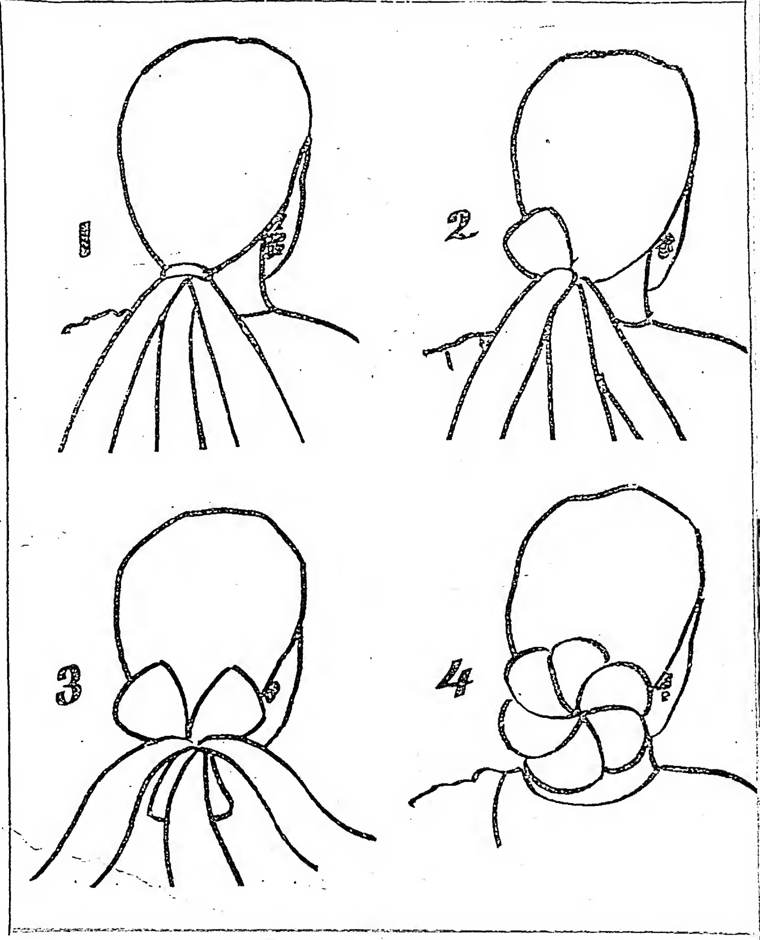
Nose Bleeds: These occur mostly in teen-age children and may be caused by a slight blow or irritation of the nose.

Loosen any tight clothing about the neck and chest and make the child sit down before an open window where he can breathe in clean, fresh air. His head must be thrown back as far as possible and he must breathe through his mouth. By no means let him bend over a basin, or blow his nose.

This is usually enough to stop bleeding, but in severe cases apply a cloth dipped in cold water (as cold as possible) to the bridge of the nose and back of the neck.

Ear-ache: This is a condition that should be treated with much greater seriousness than it usually is. Ear-ache is one of the aches for which there is always a definite reason, and if the ache is strong and persistent, a doctor should certainly be called in. These aches often start during or after an infectious fever such as measles or influenza, or during a cold and sore throat. Persistent ear-aches of this sort could lead to deafness later in life, so it is always better to overestimate the seriousness of an ear-ache than to ignore it.

In very small children, ear-aches may be caused by teething. This is just part of the pain and stops when teething does. Often children push small things into their ears, which get stuck there and cause much pain. When this happens, call for a doctor immediately so that he can get it out with his special instruments. On no account whatever, try to get it out yourself with a match stick or a hairpin. It is very dangerous to push any object, sharp or blunt, into the delicate interior of the ear. Inside, the ear is very soft and sensitive, and untold damage can be done when an inexperienced person tries to dislodge an object that has become caught in the passage of the ear. Call for a doctor immediately and to relieve the pain, a few drops of warm oil can be dropped in the ear, and a simple pain-deadening tablet may be swallowed by the child.



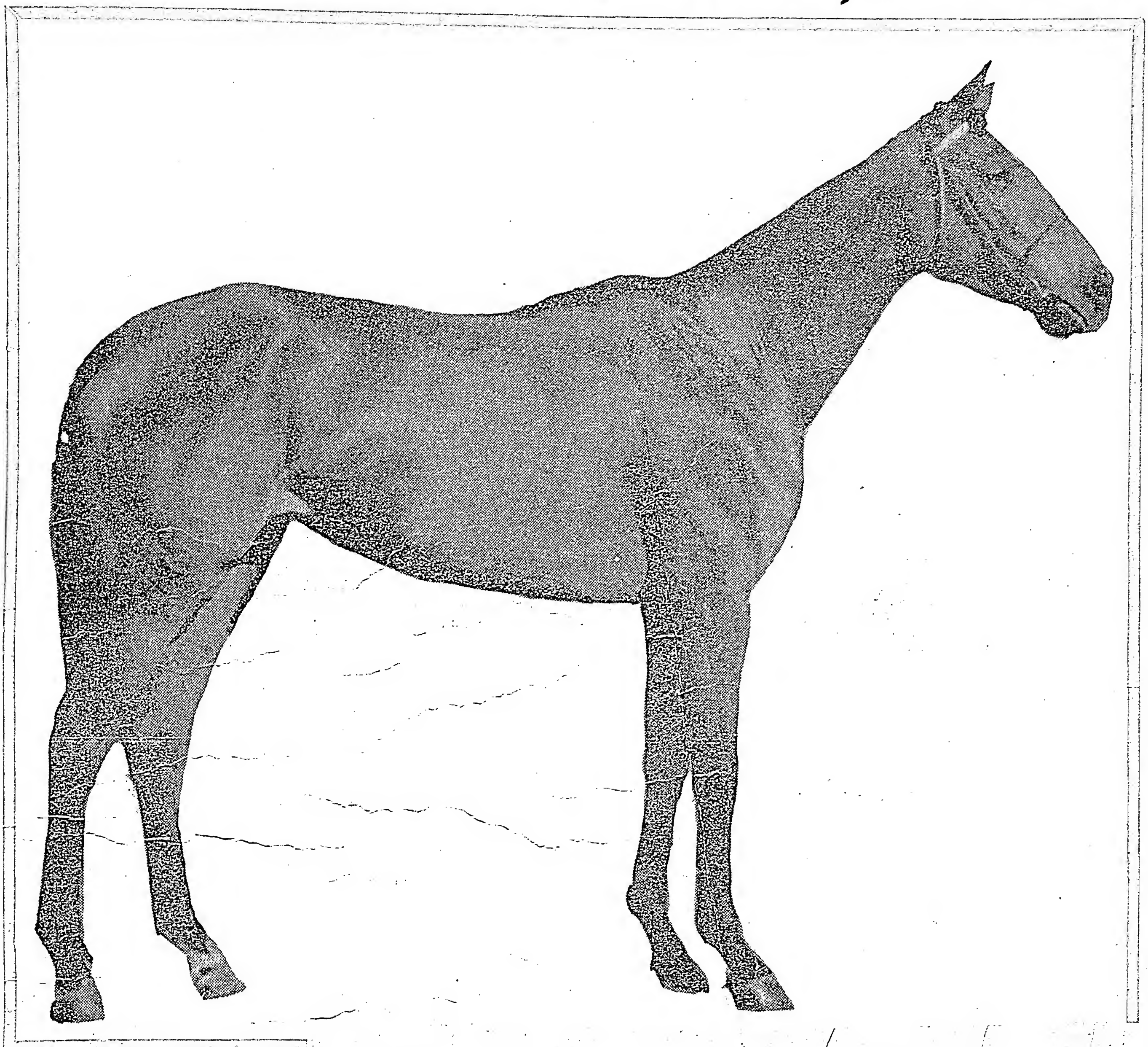
AN ATTRACTIVE AJANTA HAIRSTYLE

Wear this pretty hairstyle at a special occasion.

1. Tie your hair securely at the back with a ribbon and divide it into three strands, which must be brushed out straight.
2. Take the first strand and make a loop close to the head in the position shown in the sketch. Secure with pins.
3. Form loops with the other two strands, as shown, with the ends loose.
4. Now take the remaining part of the first strand and pass it through the second loop and around to the back. In the same way pass the second strand through the third loop and the third strand the first loop. Adjust the pins securely.

Decorate with "jari" beads and threads, or with fresh

THE BHOPAL STUD FARM, BHOPAL



Maharaj Kumari bred by N

The Bhopal Stud in its p
was started in 1941 by Col. Ya
Rashiduzzafar Khan. The clin
are conducive to the establishr
Bhopal.

In this brief period of 11
boast of a record almost unique
breeding industry in India.

Home of the great Chakor
doot, Asoka, Neola, Assault, M
Dancer, and many others, Bh
proud that many of the winners

GREEN MANURING OF BETTER CROPS

(*Continued from page 9*)

DOES GREEN MANURING PAY?

Whether increased production through green manuring pays for the loss of one crop season is the main point on which farmers want to be satisfied. The subject has attracted the attention of workers for a long time in many States of India. They think it a mistake not to take into account the residual carry-over of fertility for the benefit of subsequent crops in a rotation. The practice has definitely proved beneficial in the Punjab, U. P., Deccan, Bombay and other States. It has been found economically sound for sugarcane in Uttar Pradesh and Bihar. Recently, it has been reported from U. P. that after taking grain from 'mung' type, the crop could successfully be green manured. There is, therefore no loss of a season. Similarly in growing 'berseem' there is no loss either.

LIMITATIONS

The practice of green manuring is rendered difficult by climatic, technical and economic causes. Green manure crops need a quick and certain start during the short period of their growth. Lack of moisture both during growth and after burial, is harmful. An adequate supply of moisture can be ensured either by growing in areas of well distributed rainfall of 25 inches and above, or through irrigation.

The technical difficulties involved in the art of green manuring are largely due to lack of full knowledge about the stage and best method of ploughing-in of green-manure crop, as well as the 'time' for sowing the subsequent crop. Non-availability of seed of a certain promising variety is sometimes responsible for restricting the practice in a locality.

The economics of green manuring from the point of view of small cultivator will largely depend upon the possibility of producing the green-manure crop without disturbance to those main crops which support the finances of the cultivator.

THE MAN OF THE MONTH

(*Continued from page 6*)

They should tour the villages extensively and explain to each and every cultivator the latest and better methods of farming. The Indian cultivator wants higher yields but he has few means to develop and practically no education to plan his schemes. Literacy campaign should be taken up by the Government on a national basis and the progressive farmers should be persuaded to take more interest in their neighbours. Raja is an excellent photographer himself and believes that only visual aids like films, slides, film strips, photographic exhibitions and posters can help the illiterate cultivator in broadening his mental and agricultural outlook. Practical demonstration on the field in almost every locality will have far-reaching effects. He is opposed to the Government Takavi system as it is today. He suggests that the rate of interest should not be more than $1\frac{1}{2}\%$ so that the farmer may not be burdened to a very great extent. He also suggests that the farmers should take up bee-keeping, poultry, vegetable farming and dairying according to their means and circumstances to supplement their agricultural income.

This is the story of a man who in 1946 could not imagine that he would have to leave the metropolis and live away from a society of which he had become a part and parcel but having been forced to take up farming is doing an excellent job of it.

INDIAN FARMING

Vol. II. New Series No. 4. July 1952

PAGE

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INDIAN FARMING

Important

For immediate attention :

Subscribers Please :

We have posted renewal reminders to all those readers whose subscriptions expire with the current issue. It will be appreciated if we are advised of the renewal for the new Series Vol. II April 1952-March 1953 in time. All remittances should be sent by M. O. or crossed P. O. in the name of the Agents. In case of crossed cheques bank charges should also be included. Annual subscription remains Rs. 9/- while for six months Rs. 4/8/- may be sent. For Foreign subscribers the subscription is Rs. 9/- plus postage Re. 1/11/-.

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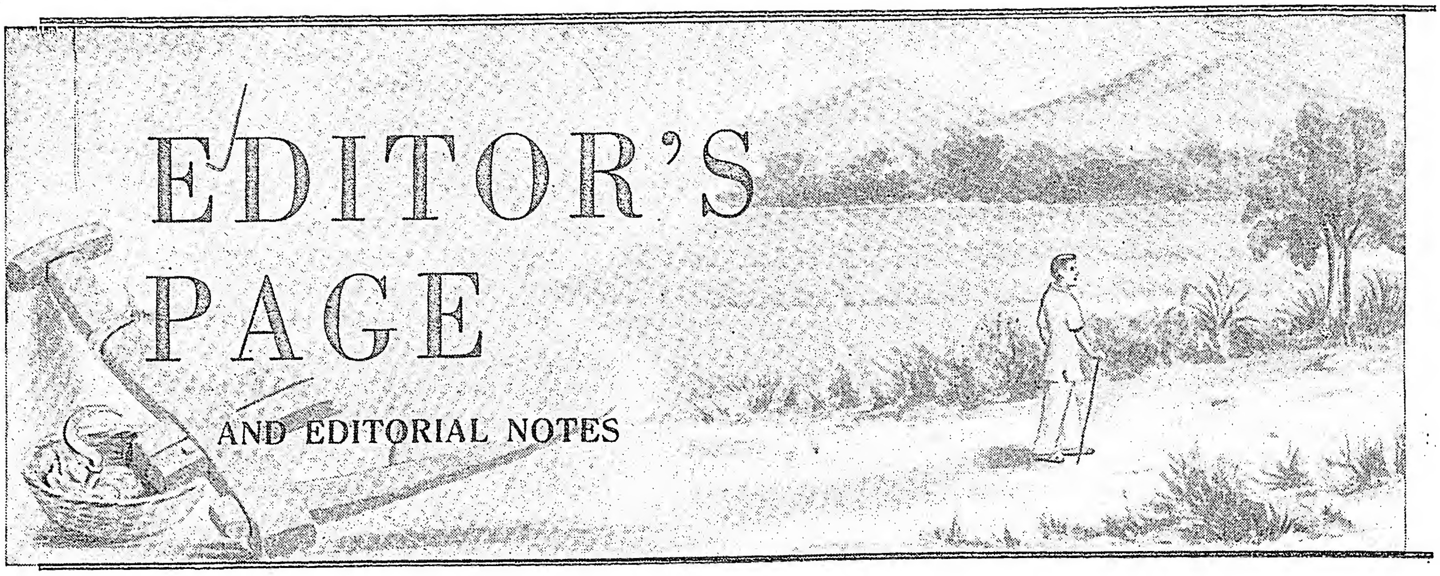


A stirring appeal by the Prime Minister made early in June once again spotlighted the role of crop competitions in getting the cultivator more interested in attempting to increase his yield. As has already been admitted prize winning performances would be difficult of repetition on a large scale but the impact of their achievement is bound to be great and it is quite on the cards that this would lead to greater attempts on the part of neighbouring cultivators to try and improve the average yield. Example of one of the village, taluk or district farmers winning a prize is sure to give an impetus to many more farmers in the area to at least try and see that their champion is not let down. In the ultimate analysis an allround desire, to try out new methods and show more enthusiasm for improved techniques, will sweep over the area. If properly backed up by constant efforts, to make it easier for the farmer to understand how exactly he could set about being a champion himself without stretching his slender means, crop competitions will play a great part in not only stepping up India's food production but in giving more life to our land and more interest in life to the farmer.

Our experience of the past two years shows that every year more and more farmers are participating in the event and results go to show that with proper treatment land could be made to yield much more than it does today. Obviously, a specially prepared competition plot is very heavily manured and has all the care lavished upon it. This care cannot be commonly lavished but attempts can be made to see that best possible advantage is taken of available means *without overworking the land.* This would automatically mean that proper information must be made available as also supplies of essentials made easily obtainable. People have to be made competition minded by constantly plugging at the theme. Maximum advantage has to be derived from the results accruing due to competitions and these are to be very widely broadcast through all available media.

FARMERS' WEATHER BULLETIN

Although it is not possible to say quantitatively how far the activities of the Meteorological Department had helped the agricultural population in their efforts to produce more food, there were several ways, in which the Department gave assistance to the farmer, both in respect of their day-to-day work as also in bringing about an improvement in yield as a long-term measure, according to information made available recently. As an example of the former, the Department issued a Farmers' Weather Bulletin daily giving a forecast of weather conditions with special reference to crops. The long-term measure comprised investigations into the relationship between weather and crop yields. This was expected to give information which would be of help in improving agricultural methods.

As regards the machinery by which weather forecast reports reached the agriculturists living in remote villages, it appears that the Farmers' Weather Bulletin was broadcast by all stations of All India Radio in the respective regional languages in their rural programmes. They were also supplied free to such newspapers as agreed to publish them regularly. Further dissemination of the information to farmers depended on the organisation and facilities available in the rural areas.

This was the responsibility of the State Governments and the matter had been brought to their notice by the Department. Thus once again the effective distribution of such important data calls for effective organisation at State, District, Taluka and Village level.

"THE MAN OF THE MONTH"

The May issue of the Indian Farming carried a story about Krishna Iyengar of Mysore State. He now writes in to say that the author has not quite followed his story and that a number of errors have crept into the narrative. Narsinha Iyengar being the second of his only two sons works on this farm which was given as an *inam* to an army officer whose descendants later sold it to the ancestors of the present owners. Farmer Iyengar states that the first ratoon crop is the best and that he introduced in his state CO.419 variety which is draught-resistant and has taken his yield to as high as 40 tons and over per acre. He pointed out that his decision to collect water in big ponds and pump it again on to his fields has resulted in the saving of 50 per cent of the irrigation water needed for the crop. Krishna Iyengar's comments on the article make interesting reading. We regret that many errors have crept into an otherwise well written article.

A MODEL CO-OPERATIVE VILLAGE

Dr. R. Ahmed, Minister for Co-operation, Credit, Relief and Rehabilitation Department, Government of West Bengal, was the chief guest at the annual meeting of Joka Multipurpose Co-operative Society in 24-Parganas. This society has, within a short space of two years done very good work in making village roads, improving tanks and excavating a small *khal* in their locality. Very few co-operative societies have given a dividend of 9 per cent to their members, as this society appears to have done. Dr. Ahmed was no doubt right in hoping that this Society would serve as a model to many more rural organisations in Bengal.

2,000 TUBEWELLS TO BE CONSTRUCTED

Two thousand tubewells in the Uttar Pradesh, Punjab, PEPSU and Bihar are to be constructed within the next twenty-four months, according to an Operational Agreement recently concluded between India and the United States of America within the general framework of the Indo-American Technical Co-operation Agreement. The total cost of the project is estimated at about Rs. 10.94 crores of which the contribution of the United States of America will be $13,700,000 (about Rs. 6.50 crores) and that of the Government of India Rs. 4.44 crores. The U.S. contribution will be made available from the 50-million dollar contribution already promised in the Indo-American Technical Co-operation Agreement.

"There are many parts of India where ample ground-water is available underneath good soil which, because of lack of sufficient rainfall, is able to produce only one crop a year during and immediately after the monsoon." Proper exploitation of ground-water resources can add substantially to the agricultural production in these regions and the project aims at tapping such resources in the Gangetic plain of India where sub-soil water conditions are proved to be favourable.

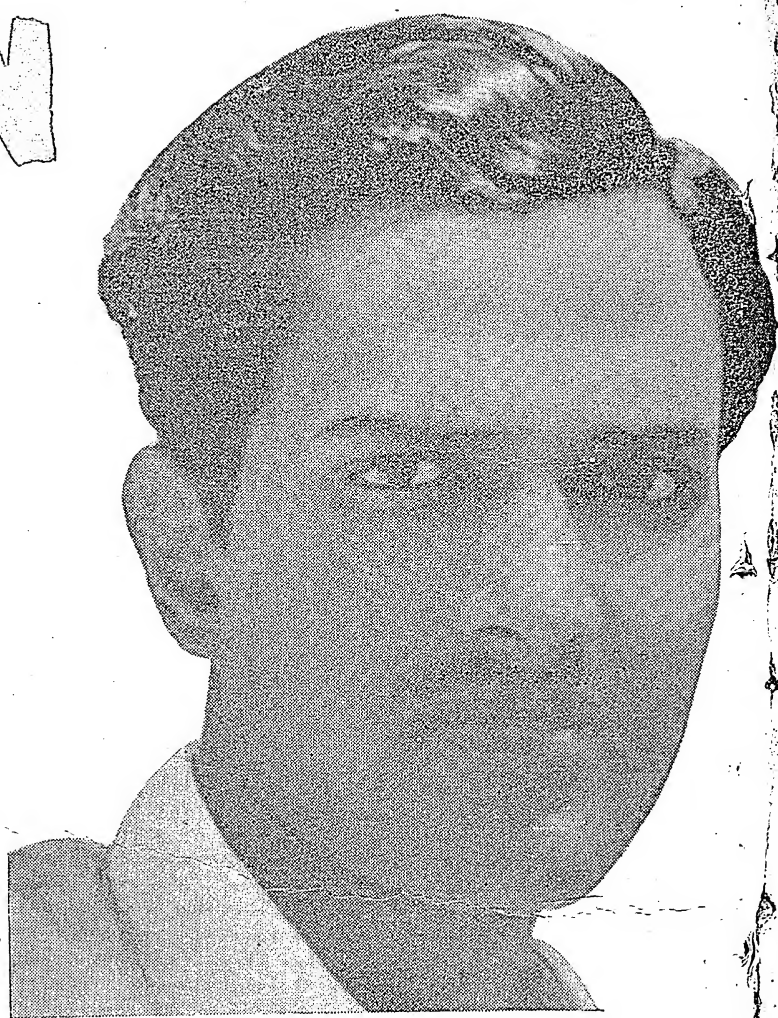
23-YEAR OLD YOUTH

THE MAN OF THE MONTH

By

A. R. VYAS,

Deputy Principal Information officer,
Ministry of Information and Broadcasting.



TWENTY-THREE-year old Jaipal Chandra of Bulandshahr in Uttar Pradesh has leaped into fame overnight. India's highest yield in potatoes was till recently 726 maunds 33 seers an acre; Jaipal Chandra has this year raised it to 735 maunds and 24 seers; for 5 years in succession, Hapur town in the Meerut District carried away the most glittering awards for the highest potato yields; Bulandshahr has now wrested the honour; it has produced a champion, who has not only qualified for the first prize of Rs. 5,000/- from the State Government, but is almost certain to receive the certificate of "Krishi Pandit" for the highest potato yield during the 1951-52 season.

When I called on Jaipal Chandra at the family home in April, he was going over the accounts of the potato farm, with his father Shri Bireshwar Chandra. On learning the purpose of my visit, he was a little shy and diffident in the beginning, for it was clear that he had had little to do with inquisitive journalists, out for "copy". As our conversation proceeded, however, he gradually became at ease, for all our talks revolved round two subjects which interest him most, his father, whom the whole family affectionately calls "Lalaji" and his potato farm, which has brought him not only good income, but fame which will in the coming weeks travel across the confines of his State to all over the country. He will be the youngest "Krishi Pandit" since the inception of the annual award.

KEEN FARMING FAMILY

Fifty-nine-year old Bireshwar Chandra, head of a large joint family is a lawyer by profession and a horticulturist by conviction. Till about two and a half years ago, the family lived in village Bhur a few miles from Bulandshahr, from where the lawyer-cum-farmer carried on his fruit farming. Even today, the members of the family are known all over the town as "Bhurwallas" and the luscious guavas and mangoes of the "Bhurwalla Orchard" fetch a substantial premium in the fruit markets not only of Uttar Pradesh but also of 44-mile distant Delhi.

The father's love of the land has been transmitted to his sons. The eldest son Bhopal Chandra who is 34, specialises in winning prizes for wheat growing; last year he bagged the first prize in the district for his wheat yield of 53 maunds 5 seers an acre; this year heavy lodging of the crop which was being harvested, when I visited his field, has reduced the yield to 50 maunds and 7 seers an acre. Even so, I should be surprised if

LEAPS INTO NATIONAL FAME

brother Bhopal does not add another award for wheat growing to his lengthening list of prizes. He needs watching, for the heavy-laden ears of wheat which I saw in his field show that another "Krishi Pandit" is in the making.

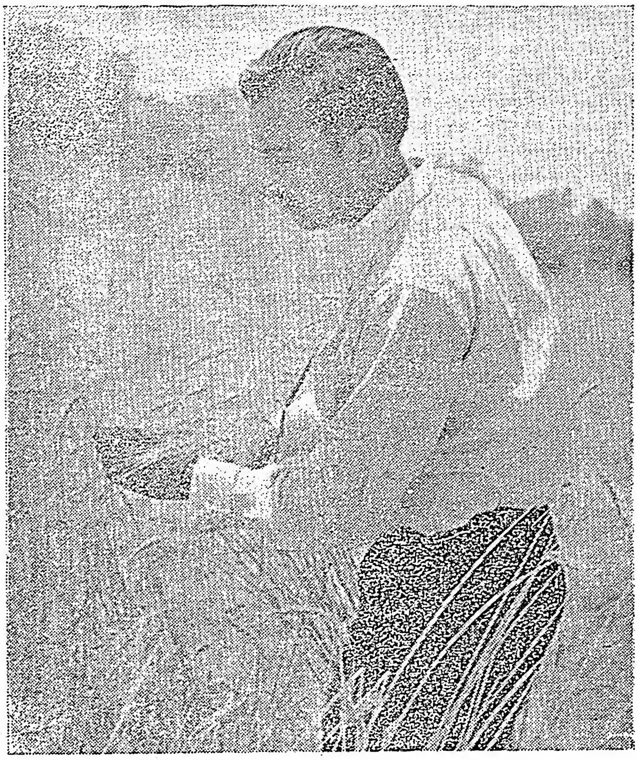
The next son, five years younger, stocky Yashpal Chandra, well-built and jovial, is the Potato Development Officer of the Uttar Pradesh Government, whose efforts during the last few years have contributed in no small degree, to the phenomenal rise in potato yields in Uttar Pradesh. In 1947 the winner of the first prize in the potato competition had raised 315 maunds an acre; in 1951-52 Jaipal Chandra has beaten that record by over 420 maunds.

Jaipal Chandra is the third son, who caught the infection of growing potatoes from his father a little over two years ago; today he has beaten the "old man" at the game! Bireshwar Chandra has been a competitor in the potato competition for the last three years. In 1951 he won the district prize for the highest yield. The fourth son, aged 20 is doing a course in electrical engineering at the Aligarh University. Whether he will be able to resist the lure of the land for long is a matter of conjecture. For Jaipal Chandra too has had training in electrical engineering at the Government Technical Institute, Lucknow. He then drifted to automobile engineering in Kanpur and later to an apprenticeship in cold storage.

I grew interested in this story of changing moods, for I had seen the same leaven at work in the case of other successful farmers too. One lawyer's clerk, another a Government employee, a third an unsuccessful trader and so on, have at last found the fulfilment of their ambition in the call of the land. Jaipal Chandra belongs to that same line of successful people, who tried their luck at several ventures, before taking to farming.

METHODS USED

I asked Jaipal Chandra to give me the recipe of his success. He told me a simple tale of hard work, unremitting care, heavy manuring, good seed and adequate irrigation. From a tiny notebook in which he had evidently been keeping a record of his methods, Jaipal Chandra related the various measures that he had taken to grow the successful crop of potatoes on his little



Brother Bhopal Chandra specialises in wheat growing. He won the district prize for wheat last year, with a yield of 53 maunds an acre.

more than half acre plot, which in the family holding stands in his own name.

The plot is irrigated by a Persian wheel. Last year too it had been sown under potatoes. After lying fallow for a few weeks, the land was grown with about 24 seers of sannhemp, which was ploughed into the area in June 1951. About 20 maunds of bonemeal was then applied to the land, reinforced by about 750 maunds of compost. Heavy doses of other manure were also used, about 50 per cent of the following quantities being applied before sowing and rest at the time of earthing. Superphosphate $2\frac{3}{4}$ maunds, castor cake 20 maunds, ammonium sulphate 2 maunds, 10 : 10 D.C.M. mixture 6 mds. 9 : 6 mixture 5 maunds and one maund of potassium sulphate in the form of liquid mixture. Sowing was done in the middle of October, the quality of the seed was Patna Red supplied by the State Agriculture Department, and the seed rate was 35 maunds an acre. The plot was divided into a number of ridges, at the rate of 80 for every 100 feet; the length of each ridge was 12 ft. 6 inches and the distance between the seed was $8\frac{1}{2}$ inches.

The first watering was done a week after sowing; in about a week 50 per cent of the plants had come up when a second watering was given. This was followed

(Continued on page 31)

The family home with fresh mown hay in the foreground

Hints to the farmer :

MAIZE JOWAR BAJRA

By **R. D. VERMA,**
Division of Agronomy, Indian Agricultural Research Institute, New Delhi.

Maize Crop (Pusa No. 2) on the Division of Agronomy Farm, I.A.R.I., New Delhi, which yielded 38 maunds of grain per acre in 1951

NOW that the Rabi work is over, you must be planning your Kharif cropping. Yes, it is time to think and plan how to produce more from your lands for your own success in farming, and to meet the increasing demands of the country. With a view to helping you to produce more, a few suggestions are made in this article, about three crops, Maize, Jowar and Bajra, which form the back-bone of Kharif cropping in the areas with low rainfall. These suggestions will be of use to you in achieving better standards of farming.

MAIZE (Zea Mays)

Soil requirements : The most suitable soil for maize crop is rich heavy loam. It is never grown on poor sandy soils. The land must also be well drained. The crop will not thrive on water-logged areas.

Preparatory cultivation : Thorough cultivation is very essential. The land should be ploughed up with a furrow turning plough immediately after Rabi crop has been removed. Do not plank after the ploughing. This operation is very important. Any Rabi weeds still standing in the fields will get buried under and on rotting enrich the soil. The roots of Kharif weeds like, Baru, Doob, Motha, etc. will get exposed to hot sun of May and June and will be destroyed, with the result that your fields for the maize crop will be comparatively freer from weeds. You will thus save lot of trouble and expense of extra weedings later-on.

Two to three ploughings with a Desi plough, followed by planking after each ploughing will be necessary after the 1st shower of rain to get a good seed-bed.

Time of sowing : The time of sowing varies with the break of S. W. monsoon. When the crop is grown for fodder or for green cobs, under irrigation, sowings may be done any time from March to August.

Method of sowing : For grain sow in rows 18 inches to 2 feet apart and 9 inches between plants in the row. For fodder, distance between rows should be reduced to 9-12″ and no thinning should be done. Avoid broadcast sowing wherever possible. It is almost impossible to get uniform germination by broadcast sowing. Further, for grain crop, dont' be tempted to sow any closer than indicated above. While a little more liberal spacing will not materially affect the yield, closer spacing, on the other hand, will seriously restrict cob formation and development, and the yield will be very much reduced. Line sowing may be done by drill or by dropping the seed in the furrow opened by a country plough. But make sure that the furrows are straight and parallel. Otherwise, it will be difficult to use bullock drawn implements for hoeing and weeding.

Seed rate : Ten to fifteen pounds of seed per acre for grain and 30-40 lbs. for fodder is quite sufficient. But make sure that the seed is sound and has good germination. You can easily test the germination by taking counted number of grains, say 100, of the seed you intend to sow. Keep the seed in a moist gunny bag in a cool place. Make sure that the seeds are kept just moist and not soaked, otherwise they will rot. After 3-4 days you will find them sprouting. Count the number of seeds which have failed to sprout. If more than 20% have not sprouted you will be wise to increase your seed rate proportionately. This test can be made a week or two before sowing time. If germination is gappy due to some unavoidable factors, fill up the gaps by dibbling the seed by khurpi as early as possible. If there are too many plants, as there would be if germination has been good, they should be thinned out to about 9″ apart. Thinning must be completed soon after germination and the

plants completely uprooted. Delay will seriously affect the growth of the plants which are to be left standing.

Varieties: Variety makes good deal of difference in the yield. A suitable high yielding variety will give higher yield at no extra cost. You should, therefor, make every effort to find out an improved variety for your area. Nobody can help more in selecting the most suitable variety for your farm than your local or nearest representative of the Agriculture Department of your State. He will be pleased to give you all the advice and will be able to meet all or part of your seed requirements. If you find the variety suitable save your own seed for next year's sowing. But to ensure purity of seed for next year, the new variety must be grown in an isolated field at least 200 yards from any other variety. This is absolutely essential for purity of the seed. This, however, will not be necessary when you have replaced the old variety. List below gives the improved varieties for some of the maize growing areas of India :

Uttar Pradesh: Tipabhia, Meerut 3, Meerut yellow, Kanpur type 31, Kanpur type 41.

Punjab: Punjab 43, Punjab 22, Punjab 12 Yellow.

Rajasthan: Sawai Madhopur (Jaipur), Basi, Hindani (Jaipur).

Madhya Bharat: Ratlam Yellow.

Bombay: Panch Mahal Dohad, Dhar (State), Baroda 3, Sameri.

Bengal: Burdwan Nepali, Chittagong Bhayabini, Burwani.

Bihar: Pusa Yellow 2, Pusa 5, Pusa 2, Pusa 14.

Hyderabad: Bidar, Aurangabad 5, Mulknur, Parbhani.

Kashmir: Kashmir local.

Delhi: Pusa Yellow No. 2.

Manuring: Maize needs heavy manuring. Unless the land is adequately manured the yield will be low. In a land of moderate fertility 250-300 mds. of farmyard manure should be ploughed in 3-4, weeks before sowing. In addition, an application of 100-150 lbs. of ammonium sulphate as top dressing when the crop is 9-12" high will greatly benefit the crop. If you are short of farmyard manure, shortage of every 50 mds. can be made up by mixture of one maund ammonium sulphate and one maund of superphosphate (triple).

This mixture should be applied 2-2½" directly below the seed row at the time of sowing. This can be easily done with a horse-hoe or country plough. Tie a metal tube(Pora) behind the central tine of horse-hoe or behind the country plough. Drop the fertilizer uniformly through the tube. Then sow the seed by dropping it in the opened furrow. This is a far more effective method of application of fertilizers than the old method of broadcast and results in higher yields. But make sure that the fertilizer is separated from the seed by a layer of 2-2½" of soil. If the seed and fertilizer come in contact the germination will be adversely affected.

Weeding and earthing up: Weeding is very essential in row crop like maize. Weeds rob the crop plants of the food material, and compete for the light of the sun. They also harbour pests and diseases. If the sowing has been done in rows weeding will offer no serious problem. Bullock-drawn horse-hoe or a cultivator or even a country plough can be run in between the rows as often as necessary. You will need a yoke of suitable length to enable the bullocks to walk in between the rows and not tread on the plants. If preparatory cultivation has been thorough, 2-3 weedings will be quite adequate. Last hoeing when the crop is 8-10 weeks old should be done with the horse-hoe with the earthing up attachments fixed. Any weeds left in between the rows will be completely uprooted. The earthing up, besides burying the weeds growing in between the plants in the rows, will provide extra support to the maize plants, thus reducing the chances of lodging.

Irrigation:—If the monsoon is adequate and well distributed no irrigation will be necessary, otherwise some irrigations will be necessary during the growth period at an interval of two weeks or so.

Harvesting and after: For grain, crop should be harvested when fully mature, i.e. when the seed has become hard and dry. The cobs should be thoroughly dried in single layer in the sun for a few days before storage as cobs or grain in a clean well ventilated store. For fodder, harvest the crop when it has gained maximum height but before cob formation.

Seed selection: You can greatly improve the quality of the seed if you follow the method given below. The method consists in mass selection of cobs having desirable characteristics for seed purpose. This should be done while the crop is standing in the field.

(1) Select large sized well filled cobs from the plants bearing more than one good cob. Choose healthy plants growing under normal condition, i.e. not on the borders or water channels. It is further desirable to select cobs from plants bearing them at a height of 3 to 4 feet above ground ; because if the cobs are borne higher the plants are more liable to lodge and if placed too low wild animals will cause great deal of damage. In unirrigated areas plants with narrow leaves should be preferred while for irrigated lands broad-leaved plants should be selected.

After selection, dry the cobs thoroughly in the sun and store them as such. Shelling at the time of sowing should be done by hand and not by beating with the stocks as is sometimes done.

Pests and diseases: Please see under *jowar* and *bajra*.

JOWAR AND BAJRA

(*Andropogon sorghum & Pennisetum Typhoideum*)

Both *jowar* and *bajra* are mostly grown as Kharif crops. In Western India and Madras *jowar* is also grown in Rabi season. Their cultivation is limited to areas of low rainfall usually below 40" of rain. Paddy usually replaces these crops in areas of higher rainfall.

Soil requirements: While for *jowar* most suitable soils are stiff loams, *bajra* will thrive even on poor sandy soils. It is, therefore, better to reserve better type of soils for *jowar* and poor land for *bajra* sowing.

Preparatory cultivation: The object of preparatory cultivation is to destroy weeds, aerate the soil and prepare it for receiving the seed. The ploughing with furrow turning plough followed by exposure to hot sun for a month or two is essential to achieve this end. For seed-bed preparation for both these crops, cultivation need not be as thorough as for maize. Two ploughings with country plough will be sufficient for *jowar* and even less for the hardier *bajra*.

(*Continued on page 32*)

WINNING OVER THE FARMER

By **U. N. CHATTERJI**

I take it that there are no two opinions about the usefulness of putting across the results of research to the farmer for his benefit. If the results of research are to be put across to him, there should be some means of doing so. The first and obvious means that at once suggests itself is to put out the information in writing. This method, of course, has been successfully employed in more progressive countries where farmers are educated and can understand the meaning of the written language. Unfortunately, in our country the conditions are quite different. Most of our farmers are illiterate and written words do not convey any idea to them.

The other methods which suggest themselves are dissemination of information by means of charts, photographs, etc. and also by lantern slide projections and movies. But these methods have their own limitations. These methods cannot be always successfully employed because among other reasons photographs, charts, etc. are quite static in nature and, therefore, cannot be adjusted to changing conditions and a dynamic programme of information service.

BY THE WORD OF MOUTH

Possibly, the only method which can be successfully employed in our country and which can be made to suit different conditions consists of utilising the man himself. He can be used for the purposes of conveying ideas and information. This method of using the man as the medium has a great advantage that it is a flexible one. It can be adjusted to fit in different environmental conditions. It also has the added advantage in that it can impart a personal touch to the programme that is desired to be put through. The special appeal a man has when he is talking to another man with sympathy and understanding is significant in the field of extension work. The extension worker can talk to the farmer, can understand his problems on the spot, can answer the difficulties which arise then and there, and discuss with him not only the questions pertaining to his farm but also possibly some of his personal problems. This last point about taking interest in problems of a personal nature is probably of particular importance in this country as this is an easy way to gain confidence of villagers.

OVERCOMING SUSPICION

There are some difficulties, however, in the manner of using this medium for extension work. The first and foremost difficulty is this that the farmer has a great suspicion of Government agents or, as a matter of fact, any person deputed to them by established organisations to solve their problems. This suspicion was born of a system of administration under which he had suffered and to which he has learnt to ascribe all his woes. Although that administration no longer exists, the suspicion persists and the farmer has yet to be made conscious of the fact that the system has changed for the better and, as a matter of fact, he is now entitled to choose the type of administration he likes.

The primary step is to overcome this suspicion. Nothing fruitful in extension work can be achieved unless this widespread suspicion is set at rest. There are many ways

Trying to spell out words

in which this can be done. Suspicion being a psychological phenomenon, naturally, psychological method of overcoming it should have preference. There should be sympathy with the farmer, sympathy not only with his vocational difficulties but also with the personal problems of his life. And what is more the farmer should be made quite conscious of this fact. There should be sincere and faithful understanding of his difficulties and the farmer should be made to feel that the person talking to him is the one who really means well. This can be done to a great extent by talking to the farmer in his own language —not the chiselled and polished language of the city-bred people, but the rustic and possibly the vulgar language that he is used to. The extension worker should himself feel the feelings of the farmers. He should see to it that the feelings of the farmers are induced in him and then only he will be able to convince the farmer to whom he happens to talk.

NARY A PREACHER

The extension worker, therefore, should not usurp or take up the role of an instructor. If he does so, his words will fail to draw the attention of the farmer and carry conviction. If the extension worker takes the place of a fellow worker then only he can be of any service to the farmer. Only then can he fulfil his mission.

Unfortunately, it appears that there is a tendency to load villagers with information. There is a feeling that the larger the amount of information the greater would be the chances of their acceptance and being used for the purpose for which they are passed on. The probability is that the villager, on the other hand, gets lost and bewildered by the volume of information and instruction given to him. Some sort of discrimination should be exercised about what is to be passed on to him for his benefit. Therefore, the information intended to be supplied to him should be relatively small in volume, and whatever is actually passed on should be well-tested and sound, should be bereft of any ambiguity, should be simple to understand and should not be verbose. The instructions should be absolutely precise. The advice should be such as the farmer can easily understand and readily adopt in his farming practices.

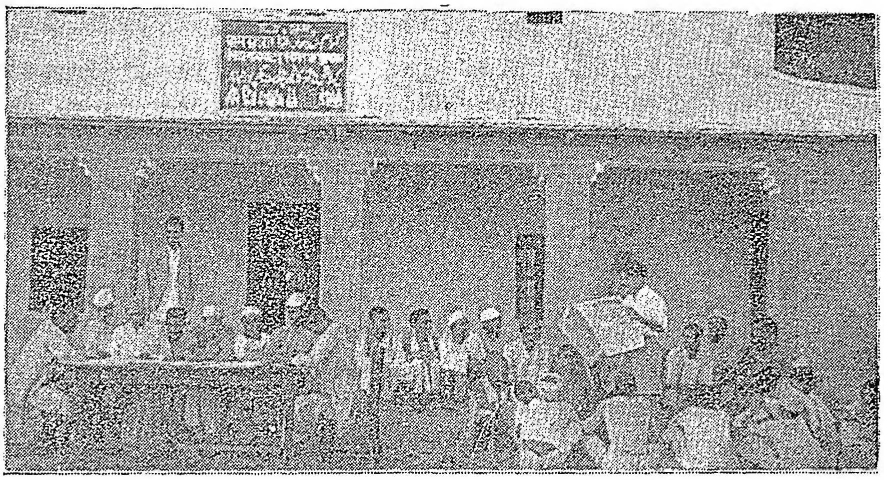
It may happen that informations, passed on to the farmer from various sources, are contradictory or at least seem to connote different meanings. Such a state of affairs is definitely not conducive to successful extension work. Again, the advice that is to be given to the farmer should take into account the farmer's conditions of life and work.

It is no use passing on information or advice which cannot be acted by the farmer however much it might ultimately benefit him and however much desirable it might be to be translated into practice.

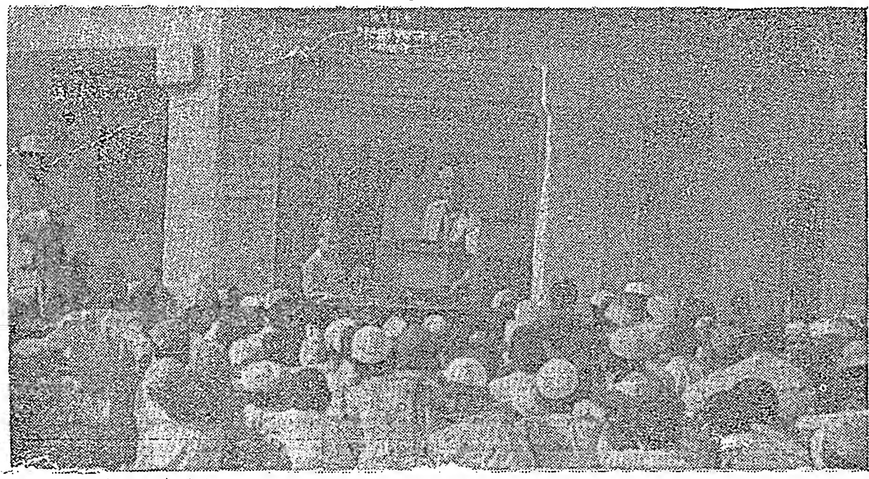
A SOUND APPROACH NECESSARY

It should be widely appreciated that the farmer's capacity to translate all instructions or advice into practice is limited and is determined to a great extent by the farming conditions obtaining in the region. The factors conditioning his work, important as they are, should not be considered exclusive of everything else; the all-round picture of the farmer's life and his family should be taken into account in outlining the programme of extension. A programme aiming at improvement in agricultural practices is not the only necessity but an improvement that will beneficially affect all aspects of the farmer's life will go a long way to ensure his co-operation in extension work. Then too it is not only the physical aspects of his life that invariably matter, but also his psychological background, his religious, and even his cultural affiliations. Unless the approach of the extension worker is psychologically sound and is able to strike a sympathetic chord in the mental phase of the farmer, any favourable response from the farmer's side can hardly be expected.

Apart from personal contact and reaching the farmer by word of



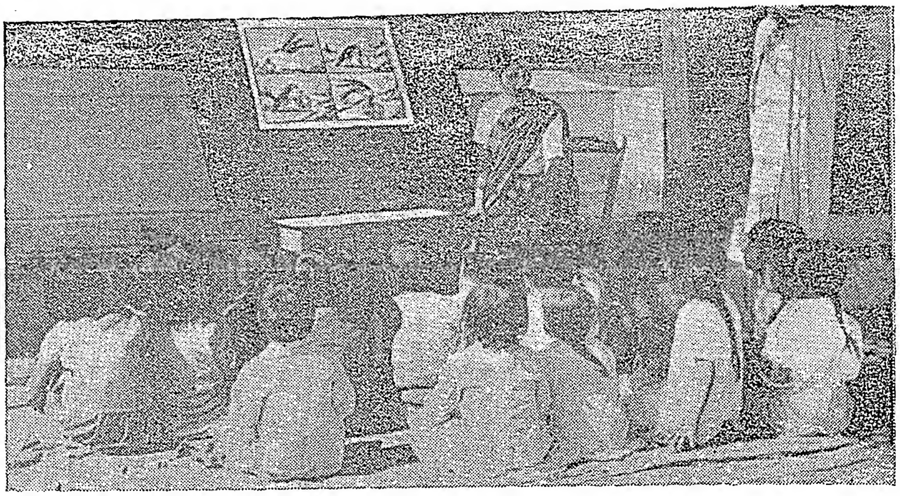
News from newspapers



A radio programme is on

mouth, other modes of publicity and extension work may also be employed to a certain extent. As I have said the farmer in this country is generally illiterate but there may be among them persons who have acquired some sort of literacy and for them written words may have a particular fascination. Such persons very often draw a great deal of respect from other villagers and are held by them in esteem and veneration. And, therefore, if written words can be made to reach him, he can possibly use his position to disseminate the information widely. Moreover, coming from one of them, the villagers will usually attach greater value and sanctity to his words. These written and printed words should not be of the type that the ordinary educated person is acquainted with. These should be more liberally and attractively printed and the language should be such as can have a direct appeal to him. Thus, such a literate person in the village can be of real help in extension work.

Practical demonstration is certainly of much importance. But projection of lantern slides, or screening of films or an exhibition usually amuses the farmer but actually does not move him much to appreciate the motives behind such shows.

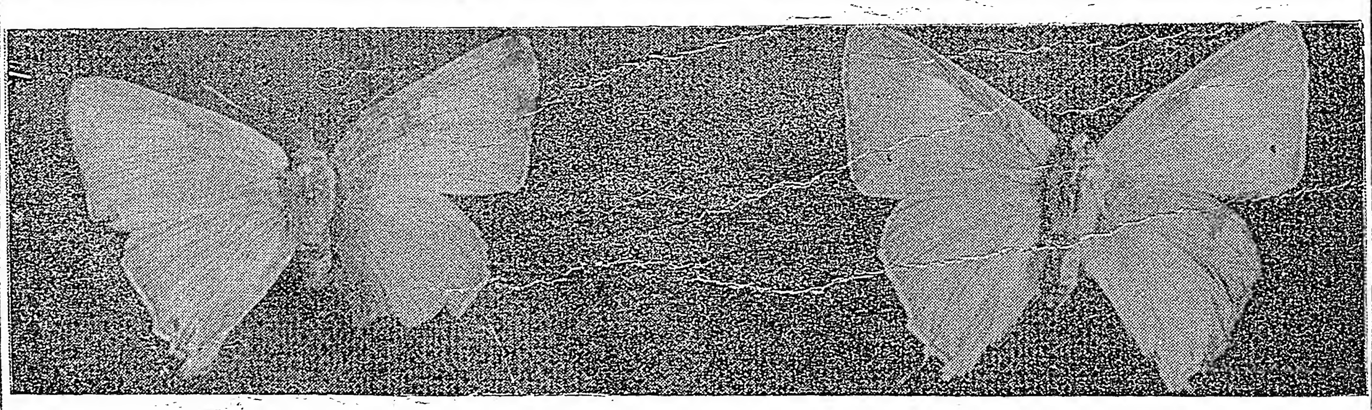


Nursery school

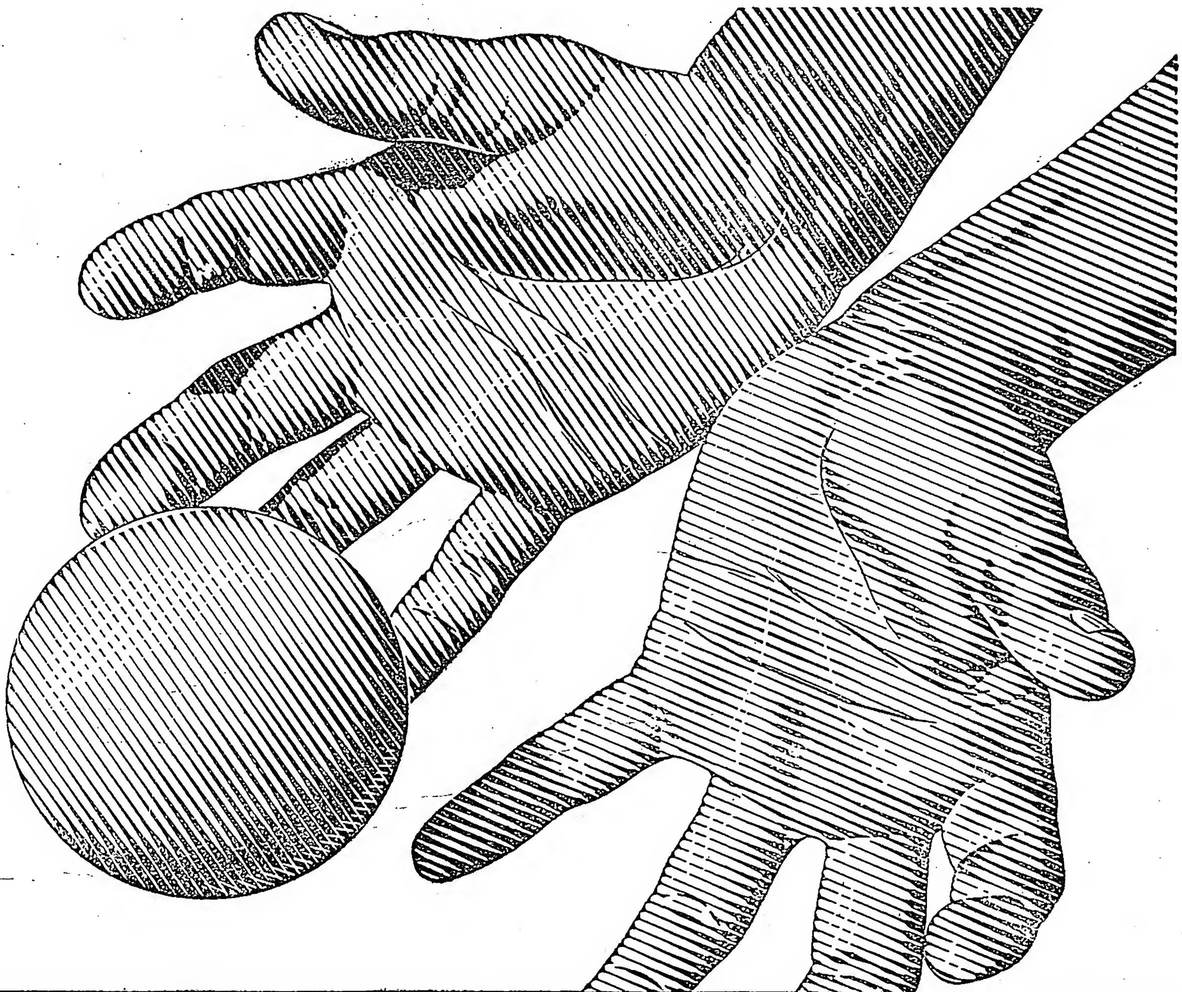
NEO-FARMERS

All our publicity and extension work centres round the actual farmer, that is, the man who has already chosen his vocation and has settled as a farmer. But we have not so far much catered to a person who wants to adopt farming as a vocation. Such a person has not been much in the picture and he has always been outside the scope of publicity and extension work. It is, therefore, necessary that publicity and extension work should be reoriented so as to appeal to the potential farmer, that is, the person who wants to take up farming as a vocation and derive his livelihood from it. Publicity, therefore, should be directed not only to the settled farmers but should also be utilised to create farmers. To the extent this is done and more people could be induced to take farming as a profession that should be the measure of success of extension work.

I have dealt with certain aspects of passing on information to the farmers for his benefit. I think it will be desirable to screen the information before it is passed on to him. This will be the surest method to eliminate the chances of contradictory information being passed on to the farmer. The quality of information and its genuineness can also thus be guaranteed. The dubious, vaguely worded or verbose instructions may be withheld from being passed on. On account of these various considerations, it would appear that there is a necessity of a central agency to canalise information. The information passing out of this agency will have an authoritative hall-mark and the farmer will have no doubt about its genuineness. His reliance on this information will, therefore, be without any reluctance or mental reservation. The set-up of such an agency should be flexible enough to allow adjustment to suit different situations in which the farmers happen to be. The set-up should also be mobile and should take into consideration human values and factors which govern relationships between man and man.



Flapping wings of multi-coloured hues, moths and butterflies present a pretty picture. But seldom is it realised that some of them are injurious pests to crops and plants. This brownish-yellow butterfly is a menace to pomegranates



VILLAGE EXTENSION WORK

By **DOUGLAS ENSMINGER**

The need ... What it is ... Its Objectives ... Types of programmes... the job of the village worker ... Some methods

THE need for village extension work in India is great. Today villagers are following traditional ways of thinking, farming and living, and by so doing they have little more than managed to survive. Living to survive means living in the midst of filth, with barely enough food to nourish the body, lacking in essential clothings for both decency and health, deficiency in health services and medical care and living in cultural isolation.

But today—now—in free and independent India the villager must through education and leadership be motivated to want for himself and his family more than survival. The villager must be educated to live as a free citizen in a new independent, democratic India. For the villager, this will mean taking on new ways of thinking, new ways of behaving, new ways of farming, new ways of bringing up a family and assuming new responsibilities as a citizen in the village and the nation. **Village extension work is both a programme and a process** of "helping village people help themselves" increase their food production and raise the general level of family and village living.

Village extension work is a process in that the village worker meets with villagers individually and in groups for the purpose of getting them to think and talk about their problems, needs and aspirations. If effective, this educational process should stimulate individuals and groups to ask questions about their present methods of doing things and become inquisitive wanting to know if there are improved methods and pressing for help in getting information about these new and improved practices. It is a process of creating concern from within the village and of the villagers wanting to push outside the boundaries of traditional experience and seeking help in finding new approaches to their problems of farming and family living. This process of encouraging self-recognition of need is founded upon a basic principle in human nature: Before change and development is possible, people themselves must recognize the existence of a problem, and want to change. Basic and lasting improvement will come only from a self-created desire for improvement and not from pressure exerted from outside.

It is also a process of the village worker and the villagers establishing a relationship of confidence in each other. For this process to be effective, the village worker must approach the villagers as a friend, and the villagers must accept the village worker as a friend. To gain and hold their confidence, the village worker must remain ever true to his duty of helping the villagers increase their competence in new methods so that the process of change from within can be accelerated.

Village extension work also is a **programme** in that the village worker is backed up by a technical staff available on call to help work out ways for dealing with specific problems and meeting given needs as they arise. For example, if a village is faced with a serious malaria problem and through discussion and analysis of the problem, the village worker calls in the Public Health specialist for advice. At this point a programme to solve the problem is suggested, so the people will know what they are being asked to act upon and accept as their solution. The suggested programme should spell out in detail: What is suggested, why it is suggested, how it should be done, who should do it, when it should be done, and the expected results. Only after the solution for the problem has been accepted by the villagers can it be said that the villagers and the village extension worker together have accepted and committed themselves to carrying out a malaria control programme.

The basic and overriding objective of village extension work is and must be to help people learn how to live as free citizens, capable of making the right kind of decision and assuming ever increasing responsibilities as citizens of the villages, the States and the Nation and the World. It is quite possible to achieve food self-sufficiency at the village level and yet fail miserably in achieving the more fundamental objective of teaching people to realize they are now citizens of a free country—to be useful citizens each person has a responsibility in helping mould and develop India into the kind of a nation they would wish for their children and their children's children.

The types of village extension programmes in a given village will be dependent upon the kinds of problems and needs recognized by the villagers. The importance of every one accepting this point of view cannot be over-emphasized. The village extension approach starts with the village worker and the villagers taking over the village problems. There may be many problems which the village worker would recognize as urgent, but only as the villagers recognize the existence of a problem will they accept a programme for solution.

This is not to imply that the village worker should confine his efforts to developing programmes to assist villagers solve recognised problems. Quite the contrary. The effective village worker always will be alert to opportunities and means for encouraging the villagers to recognize other and many times more pressing problems. However, the educational emphasis should be kept on creating village interest in a given situation until enough people recognize that a problem exists and want to do something about solving it. Only as enough people see a problem and want to do something about it can the village worker assist them in formulating a programme. To press them into action earlier usually will do more harm than good.

Village extension problems and programmes might be visualized as follows: (Helping people under-

stand their problems and need for programme is an essential step in village extension work.)

Problem

Lack of water for irrigation.
Low crop yields.
High death rate for malaria.
Lack of fodder for oxen.
Heavy soil erosion.
Shortage of bullock power.
Shortage of basic food.

Programme

Organizing a village co-operative to put down tube-wells and develop a plan for irrigation.

Adoption of improved seed varieties. Use of green manure crops and compost. Application of commercial fertilizer.

Mosquito control programme.
Grow more fodder drive.

Soil and water conservation programme.

Demonstrating new methods of hitching bullocks to ploughs to increase power.

Food planning and introducing new food more readily available into diet. Preservation of food readily available for use in short food periods.

The job of the village extension worker is to work directly with the cultivators in their fields, in their homes and in their village life. To be effective the village worker must be a teacher and a leader by example, providing inspiration and giving guidance. It is of utmost importance therefore that the village worker approach their jobs with sympathetic understanding and possess first hand knowledge about how and why villagers now follow present practices of making a living and in their living.

If the village extension worker is to be fully and immediately effective in village work, he must be ever ready **to show them how** to do the things he recommends to the villagers. In brief the village extension worker must recognise the dignity of working with his hands alongside the villagers in the fields, in their homes and their village life.

Extension teaching methods are tolls of village workers: Village extension teaching differs significantly from classroom instruction. It grows out of the felt needs and interests of the people. It can follow no rigid pattern or curriculum. Participation by the villagers in an extension programme always is wholly voluntary. Their interest and participation depends primarily upon the expectation of some value to be received. In every village there will be variations among villagers' in age, in educational experience, in interest, intensity of need, and in level of living. There also will be some variations in aspirations. Obviously, the results of village extension workers will be greatly influenced by the effectiveness of the teaching methods used and the skill with which the village worker can fit the various extension methods and the subject matter material to the diverse interests, abilities and needs of the villagers.

The most important single thing for the village worker to know about methods and approaches to people is accepted by the village people as a field. It is well therefore not to rush the people and try to pressure them into becoming immediately interested in any one thing. Once the village worker gains the confidence of the village people, then and only then can he effectively use the various extension methods.

Extension methods can be grouped into three broad categories. **The first group includes objective illustrations,** such as charts and posters, exhibits, slide film, motion pictures, pageants and plays, and most important, methods and results demonstration. **The second group includes oral presentation** such as visits with the cultivators on their land and in their homes, group meetings, and use of radio. **The third group includes such written and printed materials** for distribution as bulletins and other publication, newsletters, and news articles in papers. When properly used, these different methods are the tools with which the village worker stimulates interest and brings about improvement in farming, or home-making, or village living practices. **No one method meets all needs.** If used in the proper combinations, however, they can greatly increase the number of villagers reached and influenced to adopt better ways of farming and living.

THE OBJECTIVE EXTENSION METHODS

Experience around the world supports the conclusion that the demonstration is the foundation stone of village extension work. Demonstration is based on the idea of *showing* rather than writing or talking. It presents a proven improved practice in terms of its application to a specific situation. There are two types of demonstrations:

(1) Method Demonstration, and
(2) Result Demonstration.

A Method Demonstration is one that shows an individual or group **how to do** a given thing or carry out a specific recommended practice. It deals with actual techniques of farming or home-making such as cutting fodder, construction of a building, making a garment.

The Result Demonstration shows by example the results obtained from the practical application of a proven practice. It points out through local proof the advantages of adopting a new practice.

METHOD DEMONSTRATION

The wise village extension worker will teach people how to do things by showing them how and then helping them do the things they have been shown. This is the proper use of the result demonstration.

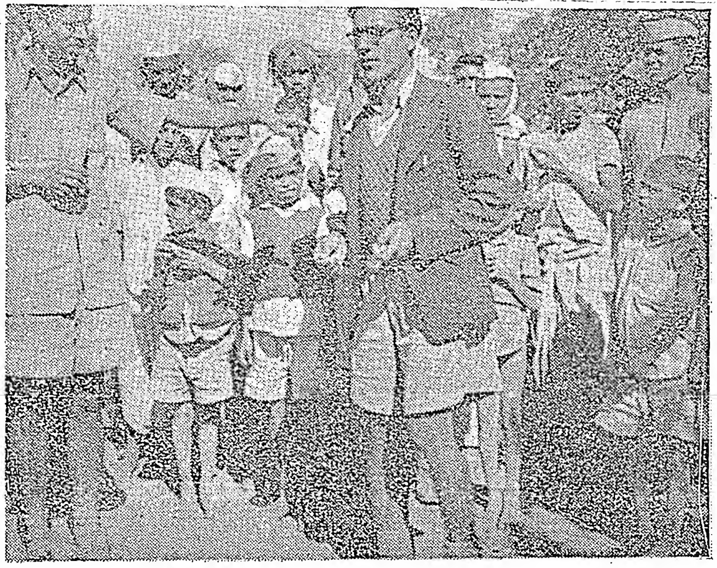
Strong Points

1. Teaches skills effectively.
2. Motivates and stimulates action because seeing, hearing, discussing, and doing are employed.
3. Builds confidence in the villager.
4. Promotes personal acquaintances between the village worker and people.
5. Serves as news-creating agency and therefore stimulates publicity.
6. Yields high rate of "takes" to "exposure".
7. Accomplishes changes in practices at low cost.

Limitations

1. Is not well adapted to all subject matter.

(*Continued on page 14*)



The Village Level Worker

ONE of the most hopeful trends in village development work has been the new rate at which college graduates are enrolling in training as village level workers. In the photo on left, the two young men in the foreground are college graduates training in the Lakna Training Center at Etawah. These two men here are serving as village level workers. In the background, citizens of a nearby village are lining up for inoculations. It has been found that with these graduates more of the essential services can be offered to the villager and in turn the villager is quicker to accept the worker as his adviser and friend. These young men expect to be promoted to a higher position following their experience as a village level worker after they have proved that they can do the work of a farmer, can obtain his confidence, and generally demonstrate the proper leadership abilities.

Another encouraging trend has been the manner in which village women have been accepting the women village level worker and coming to her for advice and training. The village level worker shown in the photo on right, standing fourth from the left has been giving these women training in child care and sanitation. Her programme includes training in food preparation and other domestic activities as well.

J. MALCOLM ORCHARD,
Ministry of Food & Agriculture,
Government of India, New Delhi.

VILLAGE EXTENSION WORK

(*Continued from page 13*)

2. Will have little teaching value if actual work and illustrative material are not seen well.
3. Requires large amount of preliminary preparation.
4. Necessitates considerable skill on the part of the demonstrator.
5. Involves slightly greater expense than do general meetings.

The following suggestions are guides for use of method demonstration :

1. Select topic pertinent to needs and interests of community.
2. Select a subject which lends itself to demonstrating.
3. Present demonstration when subject matter is timely.
4. Select place providing suitable facilities for the demonstration.
5. Publicize adequately.
6. Be thoroughly familiar with subject matter.
7. Plan demonstration so that action, explanation, and use of equipment reinforce the central idea.
8. Talk directly to the audience in a friendly, conversational manner. Avoid arguments and overaggressiveness.
9. Use appropriate demonstration materials which can be easily and clearly seen by all.
10. Use equipment that farm people have or can easily obtain.
11. Present topic step by step in a logical sequence, explaining one thing at a time.
12. Show appreciation for methods already being used by group.
13. Summarize carefully.
14. Distribute interesting supplementary literature.

(*To be continued in the next issue*)

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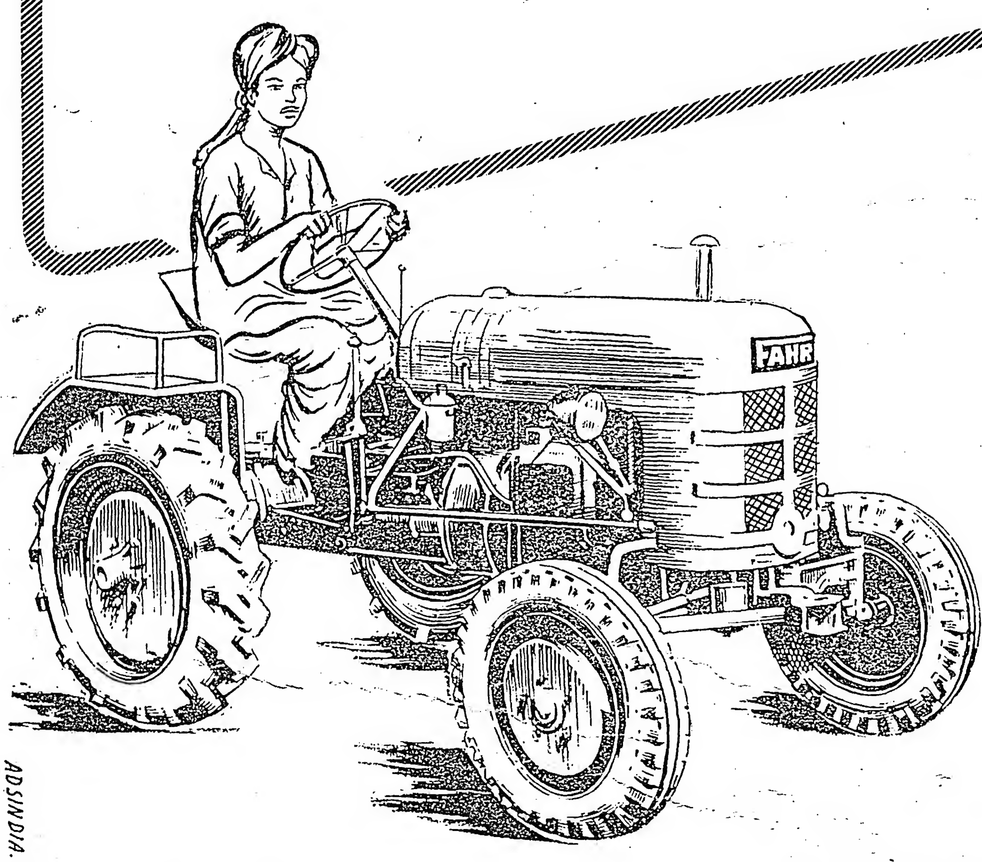

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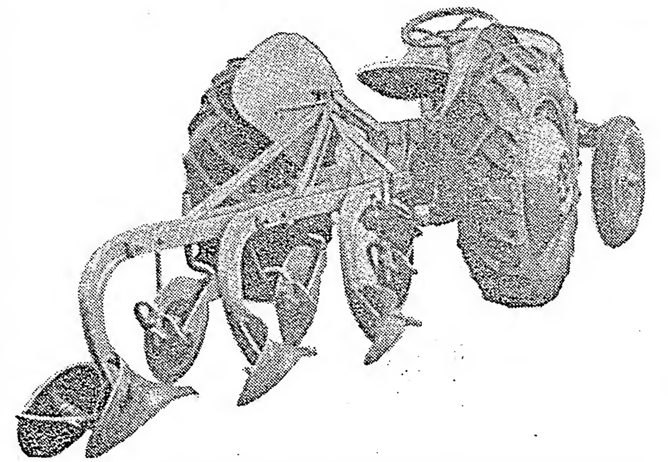


Fig. 1. *A Tractor with Hydraulic lift and integral implement (3 furrow plough)*

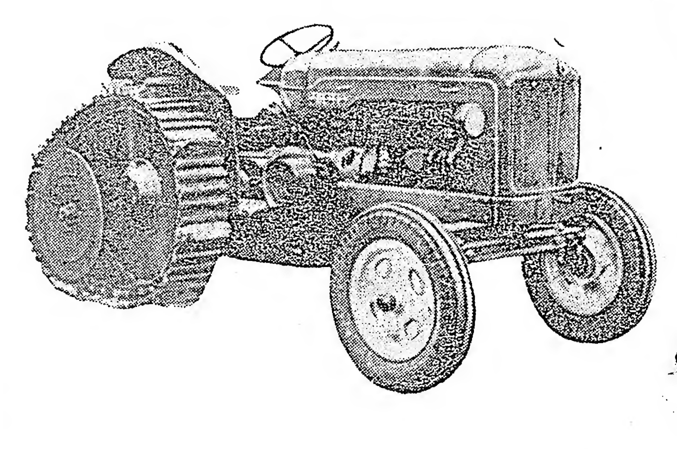


Fig. 2. *A Tractor which can be used on Rubber wheels or tracks*

WHAT IS NEW I[...] ENGIN[...]

By **R. V. RAMIAH,** Head of the Dept. of[...]

WITH regard to agricultural mechanisation, progress has been rapid in the U.S.A. and to some extent in the U.K. necessitated by conditions created by the recent World War.

AGRICULTURAL TRACTORS

In agricultural tractors, the most recent advancement has been the introduction of a hydraulic lift, whereby the tractor and its implement operate as one unit. The hydraulic lift also introduces an element of safety in that the implements will not be damaged, when stones or roots are encountered below ground level. The use of rubber tyre for tractors is on the increase, giving faster speeds in farm operation and also enabling tractors for haulage of farm produce. In the U.K. what is known as Half-Tracks has been developed to use the same tractor either on wheels or on tracks, with a view to making use of the tractor in any kind of soil or climate.

AGRICULTURAL MACHINES

In the field of agricultural implements and machinery, the disc plough or what is known as rotary ploughing is coming into use in large wheat fields, replacing the conventional mould board plough of the West. The rotary ploughing gives more output and at a lesser cost compared to mould-board ploughing. The roto-tiller or rotovator or a kind of rotary cultivators are being introduced for vegetable and garden crops in preference to other methods of tillage. Due to development of high power tractors and disc ploughs, land preparation and seeding are done in one operation by attaching a seed drill behind a disc plough. The progress in harvesting machines both for food and fodder and commercial crops has been marked these days. A number of U. S., Australian and British Companies have developed the self-propelled combines, which, while moving in a ripened filled, cut and thrash the standing grain and deliver clean and graded grain in bags on the moving machine. Unlike in the earlier design of combines, these self-propelled machines can go into the fields without spending time in opening up the fields. Digging and harvesting machines are developed for the groundnut crop in the U. S. A. and introduced in parts of Africa also. Machines for harvesting cotton called cotton pickers are replacing human labour in southern parts of the U. S. A. The latest machines in harvesting are those for sugarcane which cut and load the crop into standing trucks, mechanisation of the root crops such as potato and sugar beet is being attempted and machinery are being prepared for this purpose. Combined drills for fertiliser and seed are becoming popular in Western countries for row crops like beans and peas.

WEATHER CONTROL

Agriculture in the past was developed keeping in view the existing weather conditions of a country. Controlling weather to suit crops has been attempted in the U. S. A. recently. Making 'Artificial Rain' or getting rain when needed for crops, by dropping from aeroplanes ice pellets on clouds, has succeeded to a limited extent. In Australia and New Zealand, new devices for spray irrigation, where water is delivered to crops, as if it is natural rain, has increased the acreage for a given quantity of water. Chemical fertilisers are

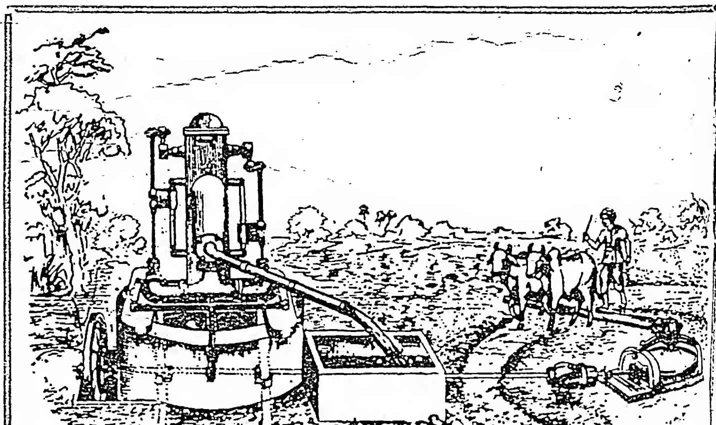


Fig. 5. *A Bullock operated pump*

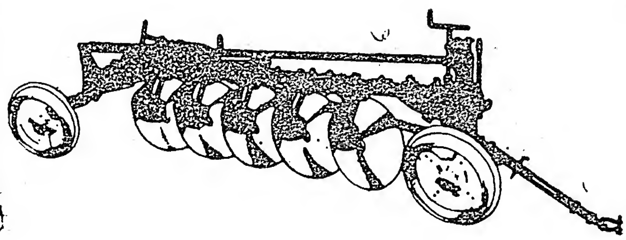


Fig. 3. *A disc plough used in wheat lands*

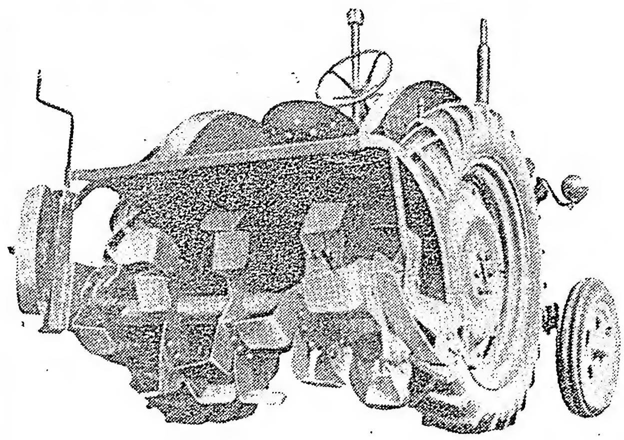


Fig. 4. *A Rotary ploughing attachment*

AGRICULTURAL ...ERING

...gricultural Engineering, I.A.R.I., New Delhi.

dissolved in such water and sprayed on to crops along with irrigation water.

ELECTRICITY IN FARMING

Use of electricity for control of fog in gardens and orchards has been experimented in Michigan, U. S. A. Blowing hot air at ground level by using high-powered engines has also been attempted in lessening the effects of fog on ripening crops. The use of electricity in agriculture has been on the increase, in all the industrialised countries of the West. Experiments on using electric power for land preparation such as ploughing have been conducted in the U. S. A., Russia and Britain. The greatest use of electricity in agriculture, has been in the dairy and poultry houses. Electricity operated milling machines, and machines for separating cream, pasteurising and bottling milk and for making cheese and butter are on the increase in Western countries. Electric power has been utilised for such novel uses as soil sterilisation for eradicating diseases through soil and for soil heating in glass houses and orchards to create the necessary temperature for seed germination. Electricity has been used in Japan for attracting and killing pests of the rice crop. Electrically operated fly killing machines are in use in many of the large Dairy and Horse sheds in the U. S. A.

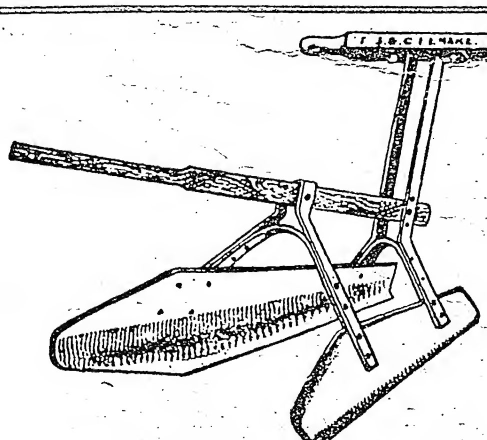


Fig. 6. *A Bund former, which is an Indian indigeneous implement, now being hitched behind a tractor in one or two units*

AIRCRAFT IN AGRICULTURE

A new machine that is making its way into agriculture is the aeroplane and the hellicopter. Many farmers in California use the aeroplane for seeding rice and some use the plane for spraying large areas of crops. The aeroplane is also being used for soil survey and locust control work. By the use of aircraft for transport and refrigeration artificial insemination of cattle in countries at long distance has been possible at low cost.

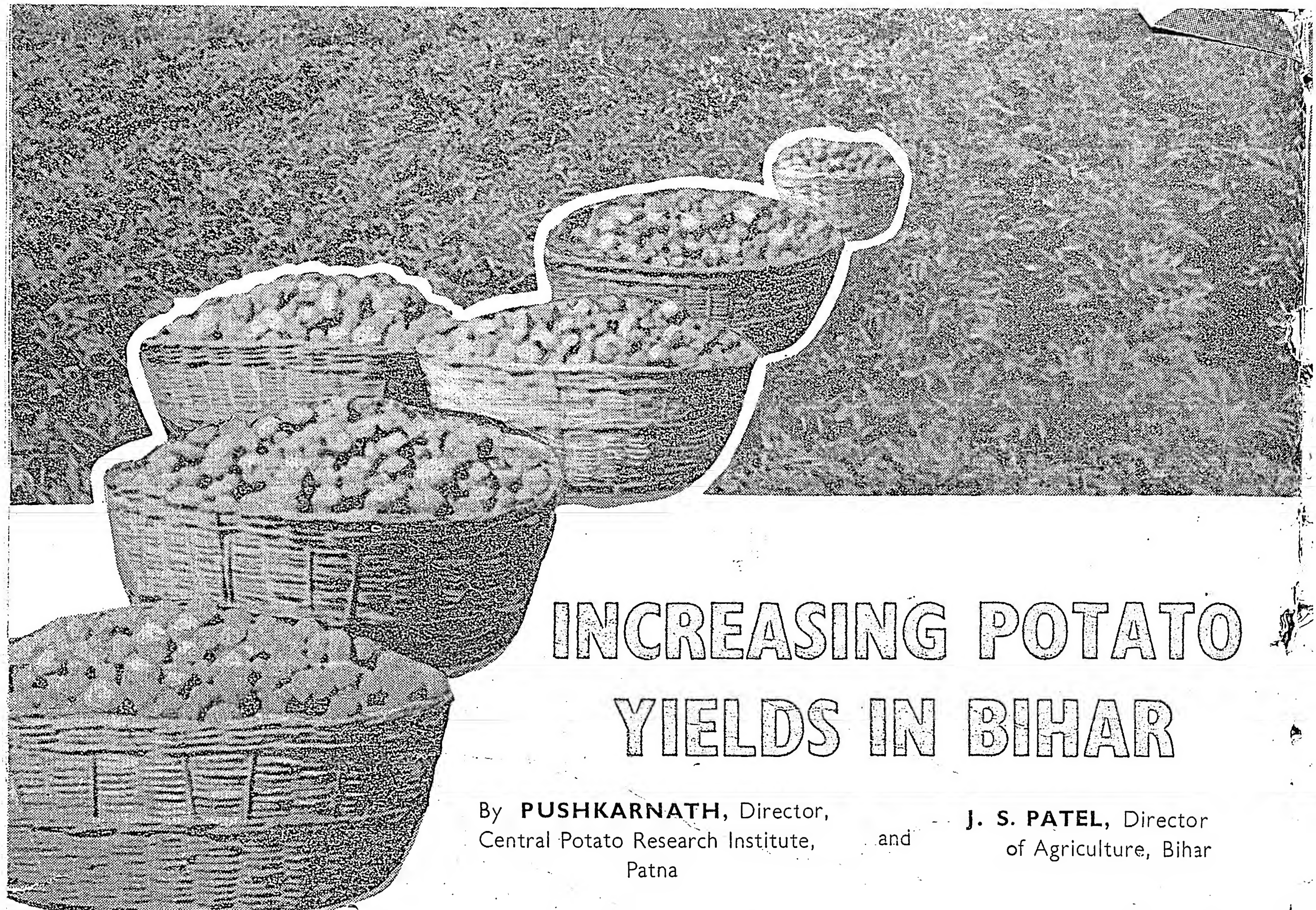
POWER FROM THE WIND

Wind is being used for running wind mills which pump water and grind corn in the Mid Western States of the U. S. A. The U. K. has planned a series of wind mills to generate and store electricity for agricultural purposes. Farm size wind mills electric plants are in use in the U. S. A. to generate and store electric power for a farm home or dairy, to run a refrigerator, washing machine or a radio.

Explosives are put to use in land reclamation work, where roots and stones have to be pulled out. Dynamite is used for preparing surface ditches or canals either for drainage or irrigation and this method is known to be cheaper than machine methods or manual labour. Machines have been developed for digging and cleaning irrigation channels or for making bunds in rice fields.

In land drainage, the use of moles or mole drainage machines to drain out sub-surface water in heavy clay soils is becoming popular in the U. K. and the U. S. A.

Here in India, experiments have been successfully conducted to run pumps by bullock power. Some of the indigenous bullock—operated implements of India are being used by hitching on the tractors to utilise the good points of both. Refrigeration is made use of, for preserving seeds of some root crops, particularly potato.



INCREASING POTATO YIELDS IN BIHAR

By **PUSHKARNATH**, Director, Central Potato Research Institute, Patna and **J. S. PATEL**, Director of Agriculture, Bihar

DURING 1950-51 demonstrations of certain aspects of potato improvement in the cultivators' fields at Patna City (Bihar) were undertaken by the Central Potato Research Institute in cooperation with the Bihar Department of Agriculture and the Plant Protection Directorate of the Government of India, Ministry of Food & Agriculture, New Delhi. A report on this appeared in the December, 1951 issue of " Indian Farming ". The present note gives an account of the scientific basis of the developmental work done during 1951-52. The programme was executed through the combined efforts of the Central Potato Research Institute and the Bihar Department of Agriculture.

MAKING GROWERS "VIRUS CONSCIOUS"

The most outstanding feature of the year is that growers are becoming " virus conscious ". Education and demonstrations have made them to realize that marked increase in yields can be expected through the use of virus-free seed stocks. Practice of roguing plants showing virus infection, as recognizable by symptoms like severe mottling or rolling of leaves accompanied by marked reduction in vigour, is now becoming increasingly popular. Cultivators appreciate that traditional practice of importing seed stocks of Darjeeling Red Round from the hills and sowing it as Katwa crop (cut and planted late in November-December) is but only a means of securing relatively disease-free stocks. Virus disease being less prevalent in the cool climates, seed potatoes from the hills are expected to be healthier than the stocks of the same variety grown in the plains. Once grown in the plains, hill stocks of Darjeeling Red Round are in great demand. The practice of roguing of Katwa crop for disease-free stock has further raised and ensured healthy standards and consequently greatly improved the quality of seed potatoes. This link between science and practice is indeed a welcome feature and Patna seed of Darjeeling Red Round should prove of real value in the country. The decision to store under control and supervision of Bihar Department of Agriculture 40 maunds of produce from every acre of crop rogued and sprayed for late blight is most opportune. Besides helping to build up stocks it would also serve as a corrective to certain malpractices habitually adopted by the trade.

SPRAYING TO KEEP OFF LATE BLIGHT

Premature death by late blight, (locally known as Afat) is a dreaded disease responsible for great reduction in yields particularly in the late sown Katwa crop. In certain years almost total crop failures have been registered. This disease, which was hitherto known to be the disease of cool moist hill regions has established firmly in the plains of India. The initial source of infection is believed to be carried with the seed tubers received from the hills. It is a safe practice, therefore, to carefully examine the tubers used for Katwa planting and rejecting those which may show

Spraying means insurance against premature death by late blight

brownish discolouration—symptoms usually associated with late blight. This serious disease, if ignored at this stage, may, in course of time, threaten the entire potato industry of the State. The Central Potato Research Institute has initiated a long range programme to evolve blight resistant varieties suitable for conditions obtaining in the plains. Making use of the late blight resistant wild potato (*Solanum demissum*) several new hybrids evolved at the Simla Station of the Central Potato Research Institute are being tested and results of value have been secured. At present, however, the only method of preventing the disease is by spraying the crop with suitable fungicides.

Demonstrations conducted in the cultivators' fields in Patna City in 1950-51 and again in 1951-52 in Patna City and also at Biharshariff have shown that proprietary product "Perenox" of the Imperial Chemical Industries is effective in giving the necessary protection to the plants against the blight disease. Proportions of various ingredients used for 100 gallons (a quantity sufficient to cover an acre of crop) are:

Perenox	.. 3½ lbs.	
Rosin	.. 2 lbs.	
Soda ash	.. 1 lb.	(This may be increased to 2 lbs. if only an inferior grade is available).
Water	.. 100 gallons.	

Rosin acts as a sticker and spreader and, therefore, it is necessary to secure a thorough emulsion of rosin in soda. This can be accomplished by adding soda ash in one gallon of water and to this boiling solution slowly adding powdered rosin. Constant stirring and boiling for 10-20 minutes is necessary to ensure uniform and vicid emulsion. Perenox powder is added and stirred up in water and later rosin-soda emulsion is added. If there be danger of wet weather to follow increasing rosin-soda to double the quantity is desirable. In practice it is convenient to make a stock solution of rosin-soda emulsion which would keep well for about a week.

In 1951-52 experiments carried out with Bordeaux mixture (copper sulphate and lime solution) have also been found to be very satisfactory. Copper sulphate,

Power sprayer with double delivery nozzles is useful large holdings

Double suction hand sprayer useful for small holdings both cheap and efficient

The new heavy yielding hybrid O.N. 2236 is also prized for its good tuber shape and size (inset)

which is the main constituent of Bordeaux mixture is manufactured within the country by firms like Bengal Chemical Works, Calcutta, Alembic Chemical Works, Baroda and Mysore Chemicals & Fertilizers Works, Mysore, and the other ingredient, quick lime is also easily available. The following are the ingredients and quantities for 100 gallons of Bordeaux mixture sufficient to cover an acre of crop :

Copper Sulphate ..	10 lbs.	
Quick lime ..	10 lbs.	
Rosin	1 lb.	(2 lbs. may be used if an inferior grade is available.)
Water soda ..	100 gallons.	

As copper sulphate takes time to get into solution, it is preferable to place the required quantity of crystals in a coarse cloth or gunny bag and suspend it over-night in sufficient volume of water. The solution thus obtained is made up to 90 gallons by addition of water. Quick lime is slowly slaked and mixed well, first in a small quantity of water, and later made up to 9 gallons. The copper sulphate solution is slowly poured into the lime water (it should never be done in any other way) and to secure a fine suspension during the processes of mixing the entire liquid is vigorously stirred with sticks. Fine suspension is preferred and slow pouring and quick stirring are, therefore, desirable. To this Bordeaux mixture one gallon rosin-soda emulsion is added. The mixture is ready and should be used immediately after preparation. Should it become unavoidable to leave any part of the solution overnight, addition of 2 lbs. Of *gur* or sugar to every 100 gallons of the mixture helps. Acid copper corrodes metallic vessels. Wooden or earthen vessels are, therefore, used. When metallic vessels alone are available they should be well coated with asphalt or painted with white lead.

Diathane is yet another fungicide which has been found to be useful. It is a liquid preparation and following is the recipe for a 100 gallon solution :

Diathane-D-14 ..	2 quarts.	(equal to 2270 cc.).
Zinc sulphate ..	1 lb.	
Lime	$\frac{1}{2}$ lb.	
Water ..	100 gallons.	

CHOOSING THE FUNGICIDE

The choice of fungicide would depend on several local considerations. Perenox and Diathane are both proprietary products and their availability and prices are dependent on foreign imports. Perenox gives severe burning effect on some cereals, especially wheat, which is often intercropped with potato. Ingredients of Bordeaux mixture are easy to secure and are available within the country. The following table gives the cost of materials for spraying an acre crop and such two or three sprays would be necessary to give full protection against late blight. Slightly more trouble needed in preparing Bordeaux solution is compensated by its cheapness.

Cost of fungicides per acre

	One spraying	3 sprayings
Perenox	16 8 0	49 8 0
Diathane D-14 ..	16 0 0	48 0 0
Bordeaux	11 2 0	33 6 0

For those having large holdings a power sprayer (Hydraulux-type) is most useful. The sprayer can be manipulated like a perambulator, and with 8 people, besides the mechanic, a sprayer with double delivery nozzles, can cover about 5 acres during an 8-hour working day. A single delivery nozzle machine can cover 3 acres a day with 5 men besides the mechanic. Cultivators having small holdings might not be able to afford a power sprayer unless they work on a cooperative basis. For these, hand sprayers have been found to be very effective. Hand sprayers operated by foot-pump are both convenient and efficient. Each machine can cover an acre a day with 3 men. Experiments with several other sprayers like bucket sprayers, knapsack pressure sprayers, etc. have presented certain practical difficulties in their operation and manipulation in the field.

SPRAYING

Time of spraying is important. Prevention and not control of the disease should be the aim. It is therefore, necessary to know the approximate time of the appearance of the disease. Cool, wet weather favours the appearance and spread of the disease. In Patna City area and Biharshariff the end of December is the time for its first appearance. Here spraying

is done about the middle of December. The second spraying may be started by the middle of January if the weather is favourable for spread of the disease, and if it is unfavourable the second spraying could be postponed to the end of January. Two sprayings are generally enough but a third may be given towards the beginning of February or a little later, particularly for Katwa crop which stands in the fields for a longer period.

Working under the technical guidance of Central Potato Research Institute, the Bihar Government Plant Protection Department has organized a scheme for spraying operations which were carried out during the year over an extensive area in Patna City and Biharshariff. Last year the entire cost of spraying was met by the State Government and during this year the scheme was worked on a subsidy basis. Each cultivator co-operating with the scheme pays Rs. 15 per acre towards the cost of the spraying and the balance is subsidized by the Bihar Government. It is hoped, that the cultivators will in due course meet the entire cost of the materials and take up the spraying work themselves as a part of normal cultural practices. In the meantime, however, the departmental scheme organized in 1951-52, will continue to operate and extend its activities over an extensive area in Patna City, Biharshariff and other potato growing districts of the State.

MULTIPLYING AND TRYING OUT NEW VARIETIES

There is very insufficient and a poor range of varieties available for commercial potato growing in this country. New varieties are being evolved at the Central Patato Research Institute and its Sub-station at Simla. These are being tried extensively both in the departmental farms and cultivators' fields throughout the country. At Patna, trials with a number of varieties in the cultivators' fields conducted in 1950-51 and continued in 1951-52 have now fully justified the merit of O. N. 2236, a hybrid originally bred at the Simla Sub-station. A heavy clean crop of uniform, white, oval shaped potatoes has won it greater favour and compared with the local Darjeeling Red Round which yields about 200 mds. per acre, O. N. 2236 is expected to yield well over 300 mds. to an acre. Quantities of seed stock of this and other hybrids available at the experimental farm of the Central Potato Research Institute are at present very small but facilities are being provided to rapidly build up the foundation stocks for distribution.

Side by side with the multiplication of newer and better varieties the work connected with the trials, which were hitherto carried out in Patna City, is now being carried out in yet another zone at Biharshariff. Biharshariff is an important potato growing tract and here the cultivators specialize in early types, like the 60-day-Satha. In trials several hybrids have yielded 2 to 3 times more yield than Satha. Besides being as early as Satha, the hybrids yielded a better commercial grade of tubers. Arrangements are, therefore, being made to try some early hybrids on a commercial scale during the next *rabi* season. New early varieties are expected to yield at least 100 mds. compared to about 60 mds. per acre secured from Satha variety.

Side by side with the varietal production, experiments connected with rational manurial practices in relation to varieties are also in progress.

COMPOST MANURE

By **C. N. ACHARYA,**
Indian Agricultural Research
Institute, New Delhi.

THE use of *gobar* or cow-dung as manure is a long established practice in this country and the manure has been found to give good results on almost all soils and crops. 'But sadly enough' said Gurcharan Singh, a successful farmer, 'due to the indiscriminate cutting down of trees and forests without a proper scheme for their regeneration, there has arisen in recent years an increasing deficiency of wood fuel in the villages, and as a consequence, the practice has become common of using cow-dung, converted into dung cakes, as substitute fuel. As a result, the quantity of cow-dung available for manure preparation has become progressively less, with the result that our soils have become increasingly less fertile and unproductive.

Gurcharan Singh said that he used *gobar* (cow-dung manure) to keep his land in a fertile condition by improving its physical condition like tilth and drainage properties; at the same time it added to the soil a substantial amount of plant food elements like nitrogen, phosphoric acid, potash and calcium. Gurcharan Singh was not wrong. It is now well known that many of the trace elements also like manganese, boron and copper which are so necessary for healthy plant growth are also added to the soil through cow-dung. Much of the beneficial action of soil humus is achieved through the agency of micro-organisms which multiply in millions on the addition of manure and help to decompose and liberate from the manure the plant food elements needed for the growth of the crop.

On account of the valuable properties of organic manures, no wonder that Gurcharan Singh found that the best crop yields could be obtained over long periods by periodic applications of such manure to the soil. This was because of the valuable properties of the organic manures. Of course these should be supplemented by mineral elements which might be deficient in the soil, e.g. nitrogen or phosphoric acid and in some cases, potash or lime. In view of the short supply, however, of cow-dung, he had to find a substitute manure with similar properties, by the well-known methods of composting.

With the help of the method of compost-making, he could prepare 5 to 6 cartloads of good manure from a single cartload of cowdung. Thus the available supplies of substitute farmyard manure can be increased considerably. Thus by taking the trouble of collecting all the refuse material like weeds, crop-stubble, *bhusa*, leaves, uneaten fodder, etc. available on his farm and also the ash, sweepings, leaf-fall and other refuse available in his house and by fermenting the same with the help of the cow-dung and urine of his animals, he could considerably increase the available supply of substitute farmyard manure.

CATTLE-SHED COMPOST

The method of composting dung with refuse, according to Gurcharan Singh, is simple. He did it as follows:

He collected the crop-litter, stubble, weeds, uneaten fodder and other refuse available on the farm and kept them in a heap outside his cattle shed. Each evening when the cattle were brought back and tied up in the shed, about 5 lb. ($2\frac{1}{2}$ seers) of the litter he spread under each animal, localised in the areas where urine is found to collect and soak into the ground. In the morning, he cleaned up the cattle-shed floor and removed the whole of the dung and urine-soaked litter, mixed them well and transferred them into a pit. Two pits of size 20 ft. length, 5 to 6 ft. breadth and 3 to $3\frac{1}{2}$ ft. depth were found sufficient for about four animals. He began filling the pit from one end by the method of sectional filling. That is he started by marking off a section of 3 ft. length of the trench with partition made of *jowar* or *tur* (*arhar*) stalks. Into this section he dumped the daily collections of dung and urine soaked litter brought from the cattle shed. In about 10 days, when the first section of the trench was filled up to a height of about 2 ft. above ground level, the top of the heap was covered and the next 3 ft. length of the trench was taken up for filling. In this way, he filled up the whole trench say in about 3 months' time after which he took up a second trench taken up for filling in a similar manner. By the time the second trench was filled up, the contents of the first trench had become mature and could be taken out for application to land and the trench could again be put to use in the same manner. Normally, Gurcharan Singh said he could get about 200 cu. ft. or about six cartloads of compost manure per year per head of cattle.

FARM COMPOST

But Gurcharan Singh had a piece of land, a long distance away from the village where he kept his cattle at night. He found it inconvenient to carry the farm litter to the site of his cattle shed. In this particular case he converted the farm litter into compost manure on this land itself. But he was sure the quality of this manure was not equal to what he obtained when the litter was first spread under the animals to become saturated with cattle urine before it was used for compost making. The composting of farm litter on the farm itself he carried out in the following manner:

The available refuse on the farm like weeds, hedge clippings, crop stubble, spoilt straw leaves, etc. were collected periodically and formed into a heap. When the heap was sufficient to fill a trench, composting was done by spreading the mixed refuse in a layer 9 inches thick all along the length of the trench. The refuse layer was sprinkled over with a slurry of cow-dung or earth mixed with water, at a rate enough to moisten the refuse thoroughly. Then a second layer of refuse 9 inches thick was similarly placed and treated with slurry and the operations were repeated till the heap rose to a level of 2 ft. above the ground when the top of the heap was covered over with a thin layer of earth. After 4 months' decomposition, the manure was taken out of the trench and formed into a conical over-ground

thin layer of earth. After another 2 months, the compost was ready for application.

TOWN COMPOST

Gurcharan Singh said he was also interested in town refuse like *katchra*, sewage sludge and night-soil which could be converted into good manure by the method of composting. His interest in this manure was aroused by a progressive farmer friend of his who was farming near an industrial town. That friend had told him that the compost from town refuse was usually richer in phosphorus and potash than cattle-shed or farm compost. Since, however, town refuse contains a good proportion of undesirable materials like broken glass, porcelain, tiles, bricks, stones, metal pieces, etc. it was necessary that the manure should be properly sieved before being supplied to farmers. The main item of expense in using town compost was the heavy transport charges incurred in taking the manure from the municipal dumping ground to the farmers' lands, which might be 5 to 10 miles away. In the case of cash crops like vegetables, potatoes, fruits, sugarcane, etc. which required heavy manuring and where local supplies of cattle shed manure were limited and costly, it was found profitable to purchase and bring sieved town compost to the farm by motor trucks, even if the town is 15 or 20 miles away. In cities like Bombay and Calcutta, he was informed, the manure was taken by railway over distances of 100 to 200 miles, by the fruit and vegetable gardeners, who gladly paid the transport charges.

HOW TO USE COMPOST MANURE?

Compost manure, Gurcharan Singh was of the opinion, was best applied about one month before sowing, preferably at the time of the preparatory ploughing, so that there might be sufficient time for the manure to get into the proper condition before the crop germinates. As regards the dosage of manure he said it would vary no doubt with the intensity of cultivation and nature of the crop grown. Thus in his irrigated areas he found compost manure to be best effective with a dosage of 10 to 20 cartloads (5 to 10 tons) per acre. He had friends in rain-fed lands; with rainfall between 20-50 ins. they would add 4 to 8 cartloads (2 to 4 tons) of the manure per acre. In the dry areas where the rainfall was below 20 inches, they thought it would be preferable to reduce the dosage to about 2 cartloads (1 ton) per acre.

Like other bulky organic manures, compost manure decomposed slowly in the soil and hence Gurcharan Singh pointed out with apparent satisfaction that it had an appreciable residual effect even in the second and even in the third year after application. He had no doubt that in several cases, the beneficial effect seen in the second year after application was better than that observed in the first year. Hence he thought except in cases of intensive vegetable gardening, it would be sufficient to apply compost manure to the same field or plot once in two or three years.

Gurcharan Singh had also been to a specialist for advice with compost manuring. During the discussion the specialist had informed him that compost manure was in general poor in phosphoric acid as compared to its nitrogen and potash contents. Thus average farm compost contained about 0.5 to 0.6% nitrogen and 0.6 to 0.7% potash but only about 0.2% of phosphoric acid. Hence while applying compost manure to the field, better results were to be obtained by supplementing it with a phosphatic manure like bone-meal or superphosphate at the rate of ½ to 1 maund per ton of compost manure used. In addition to a phosphatic supplement, it would be found profitable to add also a nitrogenous supplement like oilcake or ammonium sulphate in the case of intensively cultivated crops like vegetables, potatoes, sugarcane or paddy. Compost manure, supplemented with extra nitrogen, phosphate and potash had been found to be specially good for fruit trees like bananas, citrus, mangoes, etc.

CORRIGENDUM

On page 20 in the June 1952 issue of INDIAN FARMING four captions are given below the picture of sugarcanes at the top of the article. Here only three varieties are shown and caption number four is a continuation of 3 and should read: 3. Thin widely differing daughter plants derived from mother Co. 421 without the help of a father.

GOLD IN OUR GARDENS

DURING January, February and March the gardens of the Rashtrapati Bhavan, the Union Ministers as well as those of their Secretaries, and those of the upper ten of Delhi Society are ablaze with the Kumquat fruits.

The Kumquat belongs to the orange family and is a very decorative shrub when kept trimmed but if left untouched, it looks even prettier—loaded with clusters of tiny oranges. The Kumquat is a quick-growing shrub and in a grafted plant it begins to put forth fruits from the second year. Its show season is in the cold weather but it has fruits almost all the year round. Scented sprays of orange blossom begin to appear from March, April and again in September, October; Semi-green fruits in April, May and June are a joy to the housewife who delights her friends with cool, pale gold drinks flavoured with Kumquat juice when ordinary limes are selling from Rs. 3/- to Rs. 4/- a seer in the bazar. Kumquats are very juicy and more acidic than the lime but a little extra sugar with crushed ice helps to make it a deliciously cool and inviting drink. The Kumquats ripen again in July, August but the rainy season causes the fruits to catch disease and fall off.

Roundabout Christmas and the New Year, the fruits look like golden toy fruits. The Kumquat is of Chinese origin. Alladin, the Chinese boy, when he was sent down into the magic garden to fetch the lamp by his uncle, must have seen Kumquats and thought they were golden fruits! Children are tempted to pluck the fruits to eat them but garden lovers do not allow them. In private gardens, the owners with the exception of a few shrewd ones, do not realise the veritable store of gold in their grounds. Even the wily *malis*, who never lose an opportunity of exploiting the garden produce in their care, seem to have overlooked the value of the Kumquat.

Formerly many English women and now a good few Indian women have succeeded in making delicious marmalade from Kumquats. The colour and the flavour are both truly grand. A little experimental research by a Kumquat owner has resulted in most gratifying creations. She has not only made marmalade and fruit preserve but nice pickle which will keep long, squash, and out of the *residue* (pith and pips and skin) left after the squash has been made, even *better* marmalade. Some whole fruits lying on her sunny verandah got dehydrated accidentally, and shrank to a quarter of their original size, turning a reddish brown in colour and in taste were very like *amchoor* or tamarind and were actually less acidic than the fresh fruit.

Our fruits are expensive luxuries and are out of reach for the poor working classes. Their children suffer from scabies due to lack of Vitamin C.

If the "Grow More Food" campaign is supplemented with a "Grow More Fruits" effort round the villages with cheap, quick-growing and profuse, bearing trees, like the Kumquat, the Papaya, the Pomelo, the Sweet Lemon and Grape fruit, it will improve the health of the villagers and give them an extra income from the sale of surplus fruits. Moreover, these fruits are not attacked by parrots.

GOLDEN FRUIT RASGOOLAS

(FOR DESSERT)

Ingredients.

100 Kumquat Oranges.
3 Pints water.
3 Seers sugar.

Method.

Pluck oranges having half to one inch stalks and some with leaves. The oranges should be used fresh or as soon as taken down from the tree. Use scissors to remove the fruit.

Wipe each orange with a wet piece of cloth to remove dust and dirt. Then pick the fruits all over with a fine wooden or bone sliver (personally I use large Babool thorns) until they feel porous. Put them into a basin of water and leave one day. Next day change water and again leave for another day. On the third day change water again and leave for half a day (total 2½ days). Have ready fast boiling water. Put in the oranges and boil slowly for 20 minutes or until they feel soft but should be whole. Now lift them up one by one and immerse them into cold water to make them firm. Leave them thus for 3 or 4 hours, then place them on a stretched piece of cloth to drain them of water. They can remain all night but cover to protect from dust.

Make up syrup of 4 lbs. (2/3 of the total quantity of Sugar) of Sugar. Cook in 3 pints of water (1 pint is equal to two tumblers) and boil for 15 minutes.

Meanwhile the fruit is put into a jar. Pour on it the hot syrup. Cover with a clean cloth and leave for 3 days. Then on the 4th day, drain off syrup, thicken by boiling, pour over the fruit and leave for 4 days. Drain off the syrup, add to it the remaining 2 lbs. of sugar and boil for 20 minutes. Pour over the fruit and leave 10 days. Boil up syrup again on the 11th day until it thickens. Add 2 dessertspoonsfuls of brandy to it and pour over the fruit. Try to roll the jar until all the fruits are coated and covered with syrup. Tie down the jar. This preserve will keep indefinitely.

KUMQUAT SQUASH

Required:

Fresh fruits of the Kumquat.
Clean granulated Sugar.
A glass squeezer.
A glass jug (An enamel or earthenware one will do).
One small enamel basin or a large deep plate.
One knife.

Method:

Wash and wipe dry the fruits. Cut into halves. Squeeze out the juice on the squeezer and put by the skins and pips and pulp on the plate. Collect as much juice as you need. Now strain the juice free of seeds. Now take a pan or Degchi (An enamel pan or aluminium or a Kalaid pan should be used) and put into it sugar and juice in this proportion:—

Kumquat juice: 2½ of Sugar. Keep it or rather simmer it on a very gentle fire for a few minutes or until the sugar is thoroughly dissolved. Take down, cool and bottle tightly.

N.B.:—The bottle should be well cleaned and sterilized before the squash is put in.

KUMQUAT MARMALADE

(From the Skins and Pulp)

1. Remove the seeds and scoop out the pulp from the skins and keep aside.

2. Take the skins and mince them very fine and boil in water until quite soft. (If a rather bitter flavoured marmalade is desired, then the skins should be boiled in water sufficient to soften them, i.e., no water need be thrown away). The boiled skins are drained of water.

3. Now take the pulp, the bigger pieces of which may be chopped up. Weigh Sugar against pulp, i.e., 1 part sugar : 1 part pulp (but a little more can be added if greater sweetness is desired). Dissolve the sugar by adding water sufficient to melt it on the fire. Now add both the mass of pulp and cooked skins to the sugar and cook or simmer on a gentle fire until the marmalade looks a clear golden colour. Remove, cool and bottle.

KUMQUAT PICKLE

Ingredients.

25 Ripe and firm Kumquats.
Red chilly powder.
A teaspoonful of *hing*.
Mustard seeds—a handful.
Salt.
Til oil (or mustard if preferred)
Methi—1 teaspoonful roasted and ground.

Put a little oil to heat in a Kadai or fry-pan, now put in a few whole fruits and roll them about (1 tablespoonful of oil is sufficient for 2 dozen fruits). When they feel softish—they may even burst a little—remove to cool them in a glazed earthern jar. When all are ready, sprinkle 2 tablespoonfuls of ground chillies, salt to taste, 1 level teaspoonful of *hing* powder, the same of roasted *methi* powder. Now heat 2 or 3 tablespoonfuls of *til* oil, add 1 small handful of brown mustard seeds until they crackle and pour it hot over the limes which should be halved or quartered before this. Shake the pot up and down and tie down the cover with a clean piece of cloth. Daily sunning and shaking up for a week would ensure its keeping good for a year. A clean piece of muslin dipped in oil should be placed on top to prevent mould forming on it.

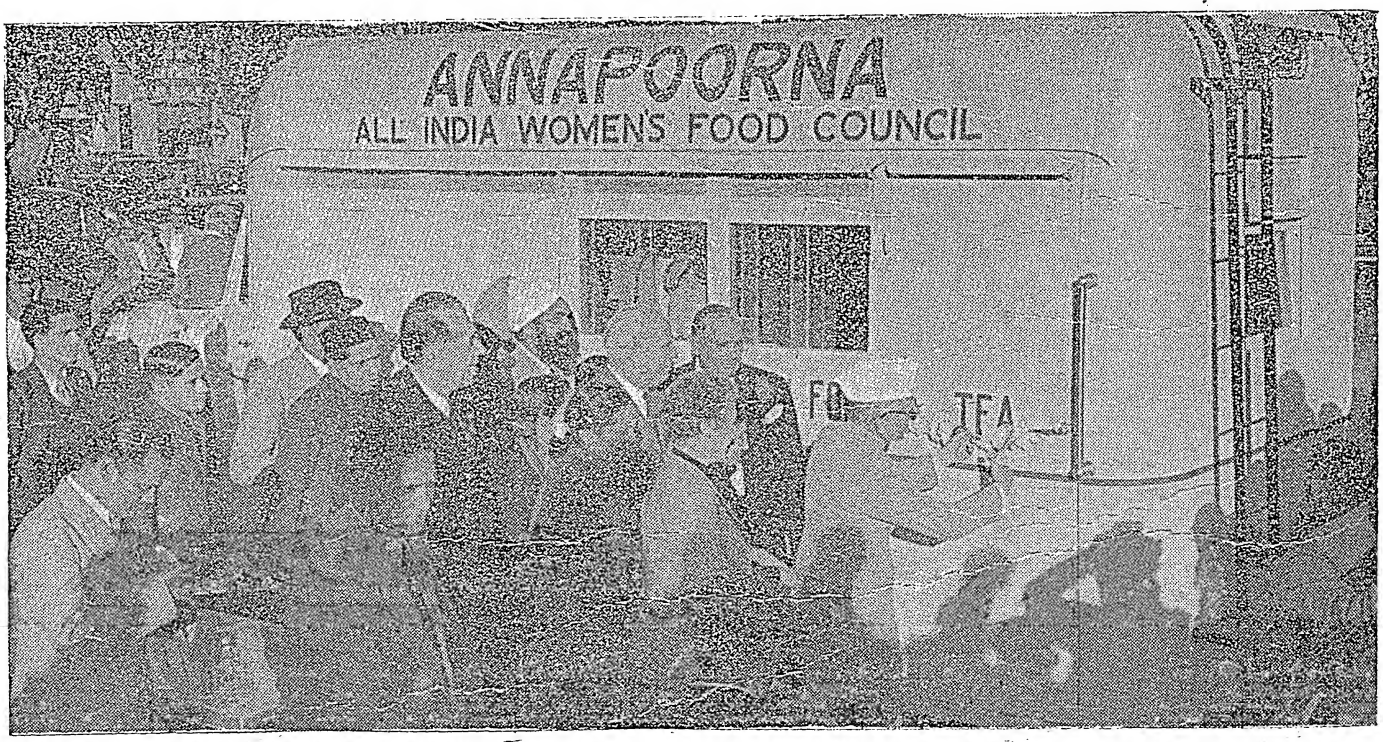
KUMQUAT CHUTNEY

(Fresh, Ready for Use)

Soak 3 dried Kumquats in water. Wash and clean a handful of Pudina leaves, Chop fine 1 large onion, 1 green chilly, $\frac{1}{4}$ teaspoon sugar or a tiny bit of *gur*. Salt to taste.

Cut up the fruits. Grind them into paste on the *masala* stone or Sil. Add the rest of the ingredients and serve up with luncheon dishes.

—RAMPA PAL

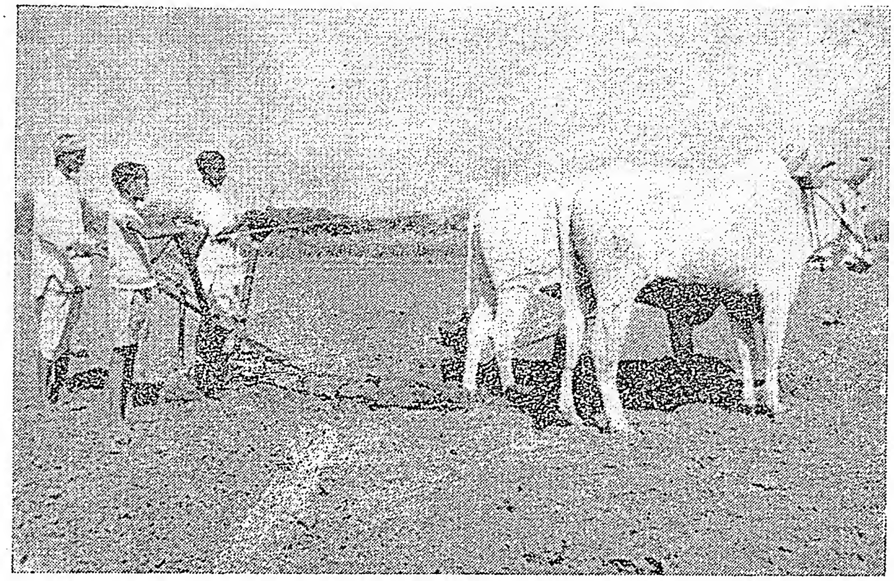


"ANNAPOORNA" MOBILE CAFETERIA

The latest welcome addition to the activities of the All-India Women's Food Council in Delhi is the 'mobile cafeteria'. In practice it is really an extension—should we say mobile extension—of the Annapoorna. The moving cafeteria is fast becoming a familiar sight on the streets. People desiring non-cereal food have no longer to await their turns in long queues in the Annapoorna—now that it has been brought to their very doors. The moving cafeteria is thus supplementing the work of Annapoorna in popularising non-cereal food. Crowds gather round it for refreshments wherever it stops. For example, near the India Gate where the van parks in the evening, a large number of workers from offices nearby collect round it on their way home to be served with snacks.—HARKIRAT SINGH

A SIMPLE DEVICE FOR THE PLACEMENT OF FERTILIZERS

By **R. D. VERMA,**
Division of Agronomy, Indian Agricultural Research Institute, New Delhi



Fertilizer placement machine in operation

PLACEMENT of fertilizers, as against the old method of broadcasting, has become an established practice in agriculturally advanced countries as a practical means of economising in the use of fertilizers and their better utilization.

When fertilizers are placed in the vicinity of root zone of crop plants, they are more effectively utilized than when broadcast. Moreover, placing of fertilizers near the root zones also minimises losses of nutrients, due to leaching, gas formation, their uptake by weeds, etc. are greatly reduced. Further the immobility of phosphates, when applied to soil, necessitates placing of such fertilizers as near the roots of plants as possible.

In India, economy in the use of fertilizers assumes still greater importance, because of the limited supplies and the urgent need to fertilize as large an area as possible for increased production.

While initiating experiments on the placement of fertilizers at the Indian Agricultural Research Institute, it was found that the imported machines for the placement of fertilizers, besides being costly, were unsuitable for use in small experimental plots. It, therefore, became necessary to devise a simple yet accurate method to place fertilizers.

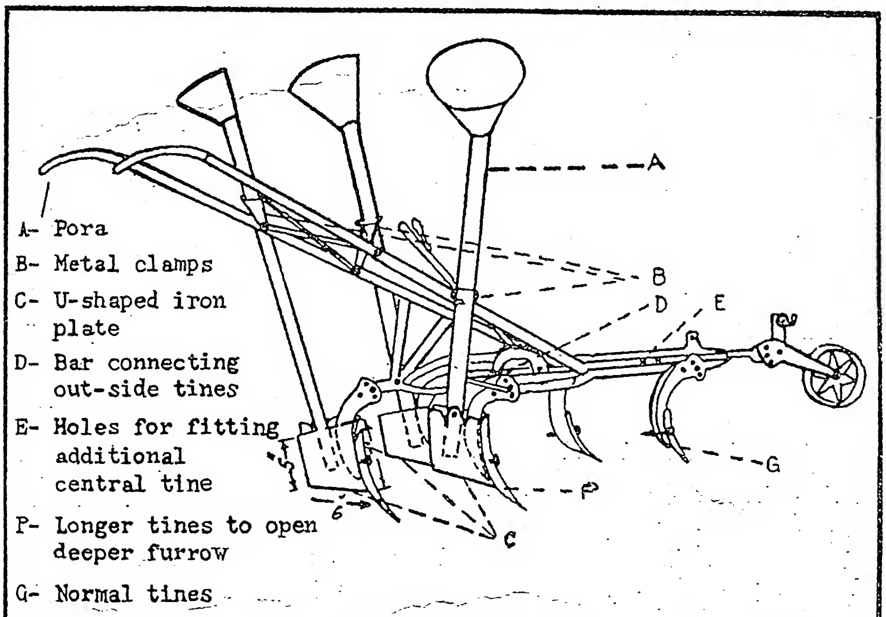


Fig. I

MINIMUM REQUIREMENTS

It was realized that any machine to be satisfactory for the purpose, must fulfil the following minimum requirements :—

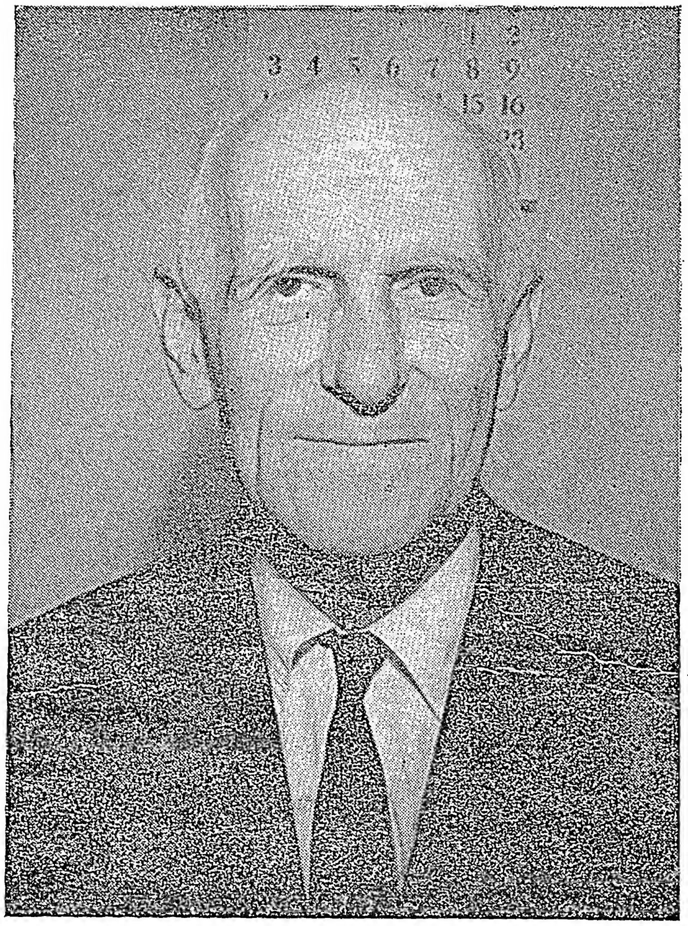
1. It should be cheap in initial cost, easy and simple to handle but at the same time do the job accurately.
2. The depth and distance between the furrows opened by it must be adjustable in order to enable the fertilizers to be placed at the desired position.
3. Seeds and fertilizers once placed in position should not get disturbed by subsequent operations like beaming.

On looking round for such a machine, it was found that the horse-hoe with certain simple modifications and attachments would satisfy the above requirements admirably.

In a horse-hoe tines are adjustable both for distance between furrows and the depth of furrows. It opens a narrow furrow which gets completely covered, and therefore the seed and fertilizers once placed in position cannot get disturbed by subsequent operations. In addition, it is an implement which is of great use to farmers all the year round for such operations, as inter-row cultivation, mulching, earthing up, etc.

(*Continued on page 31*)

LITERACY TRAINING BECOMES PART OF RURAL DEVELOPMENT



Dr. Frank C. Laubach

Dr. Frank C. Laubach will Lead Extension Drive on Country-wide Basis

By **U. N. CHATTERJI**

APART from food and clothing, another problem almost equally important has to be tackled in order to raise the standard of living of Indian villagers. This problem is to make illiterates able to read and write. Illiteracy is very widely prevalent in India. At present only about five percent of the people in this country can read and write. The importance of liquidating illiteracy is widely accepted and it is not necessary to underline the task.

It appears that the problem of solving illiteracy in this country is a gigantic one and has to be tackled on a country-wide basis. Added to this is the difficulty that a very large number of languages have to be contended with.

The all-round development of Indian villages has been undertaken by the Community Development Projects. The programme of work includes a drive for literacy as well. The work in this connection has been entrusted to Dr. Frank C. Laubach. With this assignment to attend to, Dr. Laubach becomes officially attached to the Community Project Administration on July 15, 1952.

Dr. Laubach has a very wide experience of literacy training programmes. In the past 30 years he has worked in 85 countries teaching illiterates to read and write. He has organised and conducted literacy programmes and courses of study in over 232 languages.

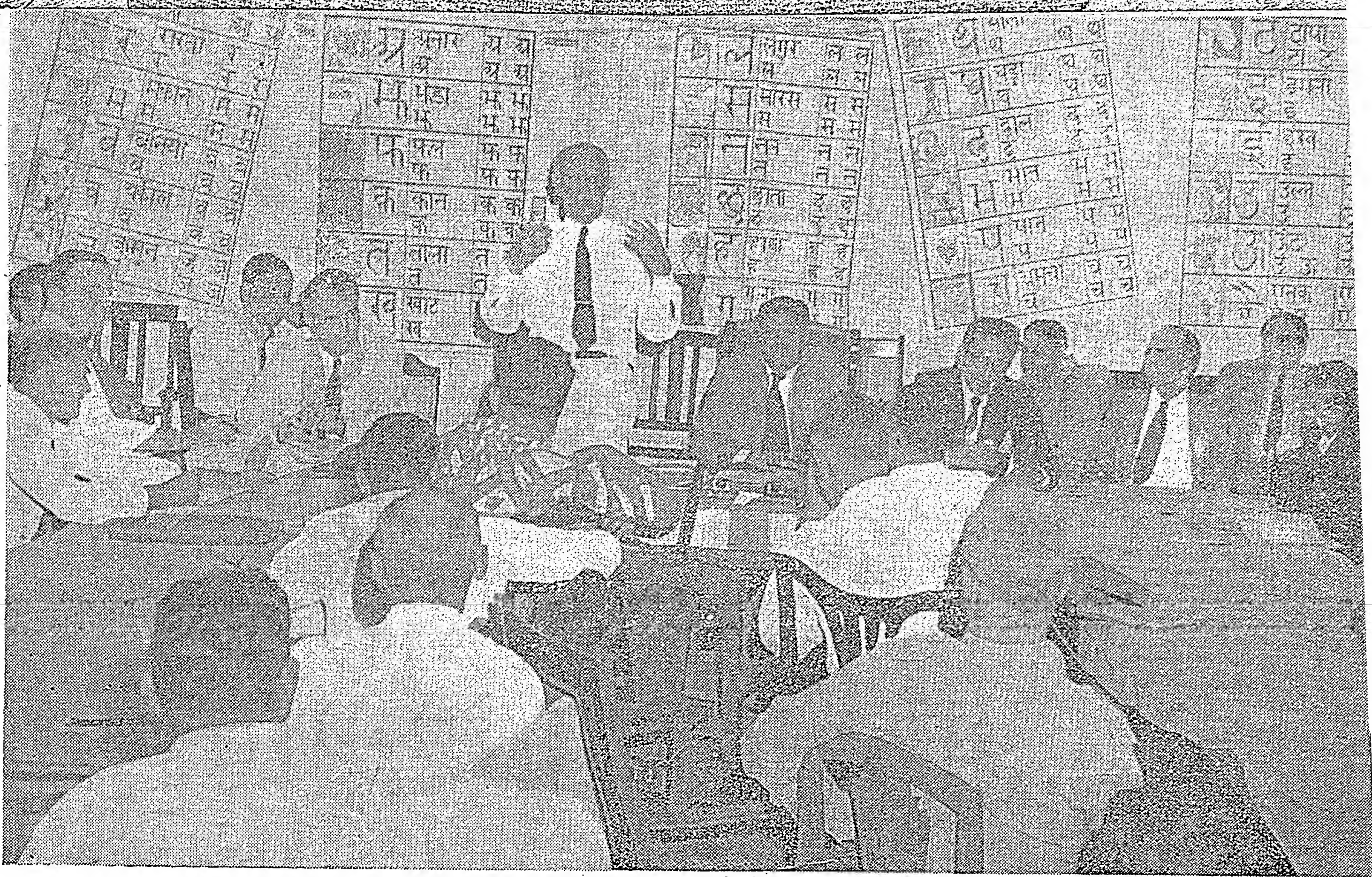
Dr. Laubach is no stranger to India. During the last 15 years he has been visiting this country off and on working on literacy training. His outstanding work in the field of organising literacy campaigns throughout the world has been recognised; appreciation from his Alma Mater—the Princeton University has come in the shape of an honorary Doctor's degree.

The greatest difficulty to be encountered with in a literacy programme is the unwillingness of the illiterates to learn. This resistance, research has shown, emanates from a widely-held idea among them that learning is a painful process and much labour and effort are required. Dr. Laubach's methods however make learning a pleasure to the illiterates who find that little or no effort is needed and that they acquire ability to learn rapidly. Dr. Laubach's methods develop their eagerness to get additional information, and even encourage them to seek recruits to participate in his educational programme.

Dr. Laubach's training method in adult literacy in villages consists of several stages. First the literacy training charts are posted in a convenient locality in a village and the villagers are called round and the charts explained to them. Literates are appointed to assume responsibility for explaining these charts to the villagers. These charts are very simple and very little explanation is necessary. The trainees can thus master the contents of the charts easily and without any strenuous application.

The next stage commences after the villagers have understood the charts and have acquired the sounds thoroughly. He is given a certificate and provided with a primer based on the knowledge he has already acquired and which he can read and understand with very little outside assistance.

In the third stage the villager is awarded another diploma or certificate after he has proved that he can read the primer already given to him. He is then given



Dr. Laubach explaining his methods

the second book. In the second book he encounters 400 new words. After he has successfully gone through this book the trainee will have a reading vocabulary of 520 words.

At the final stage the trainee is allowed to buy follow-up literature which discusses problems related to his farm and living. He is also asked to train others in the use of charts and ask them to co-operate in literacy training programmes.

Dr. Laubach will give short training courses in all Indian States except a few on adult literacy. He will also meet and discuss the subject of literacy training with experienced persons connected with teaching and education. He proposes to prepare literature which could be used in the programme of adult literacy campaign to be undertaken by the Community Development Projects. Earlier this year Dr. Laubach visited this country and was here for sometime. During his stay he prepared literature in Hindi language for use with literacy drive in Hindi speaking areas. He also undertook preparation of literacy literature in some of the major languages of South India. During his present stay he will devote his time to the preparation of similar literature in other major languages spoken in India. It is estimated that it will take approximately 130 days to complete the preparation of literacy training material in all the major languages of India.

In order to undertake the programme of adult the use of Dr. Laubach's material and his methods. The training of teachers is a very important phase of the programme because without sufficient number of available teachers it is difficult to visualise how the programmes could be carried through. These training classes for teachers will be held in all the principal States of India. One training course is scheduled to be held in Nilokheri from the 1st to 6th of August, 1952.

The programme will also include preparation of literature which could be placed in the hands of people who have already been trained to read and write. The follow-up literature can only be prepared by outstanding individuals who have received training as literacy teachers. The follow-up literature will deal with problems of rural life and be written up in a manner to fit in well with the original literacy training literature. The follow-up literature should allow the student to rapidly add to his mastery of words and at the same time acquire new knowledge necessary for him to function effectively in a progressive agricultural society.

Literacy training charts have already been printed in Hindi. A Hindi primer and a Hindi second reader are also available. These have all been done by Dr. Laubach and he has also trained some individuals using this material in Hindi. The Agricultural Information Department of the Uttar Pradesh Government is planning to prepare follow-up literature in Hindi.

Dr. Laubach has firm faith in his methods and

KOSBAD AND ITS AGRICULTURAL COLLEGE

By **HOMI J. H. TALEYARKHAN**

KOSBAD is a place little heard of by urbanites. It was formerly a little Adivasi village, about three miles from the station of Gholvad 80 miles from Bombay on the Western (B.B. & C.I.) Railway. It is to day a fine Agricultural school in the state of Bombay.

It is beautifully situated—right on a 200-feet high hill top, visible from miles around. The air is cool and fresh almost throughout the year. It commands a wonderful panorama of the distant countryside, the hills, known as the Kainad hills around, and near-by Adivasi villages known as *padas*.

The school grounds stretch over an area of 260 acres. The students work in the fields and their classes are held under the expansive shade of gorgeously spreading trees. Students sit and study how to produce more so that the lot of the people may be improved.

Originally the school was one of the activities of the Gokhale Society of Education. Government took it over only in 1948. It is since then that it has developed into a regular agri-educational colony.

There is accommodation at present only for 50 students, mostly sons of farmers and agriculturists, who are admitted to the college after they have passed the seventh standard vernacular. The course extends over a period of two years, at the end of which they are given a diploma. Then they return to their parents' farmlands or they join government service. The former course is more encouraged.

The students do not pay any fees. Not only do they receive free tuition from five fully trained and qualified teachers, but also free lodging. On top of it, each student receives a stipend of Rs. 20 per month about three-quarters of which he spends on his food.

I saw the special building erected for the accommodation of the students. There are five large rooms with ten students in each. They have a kitchen and a mess room, spotlessly clean. All the boys I met were smart and cheerful and they hailed from all parts of the state. The staff are provided their own quarters.

Going round the fields and grounds of the school is a treat. There are all varieties of growth of vegetable, fruit and flower. Each species is marked so that students can follow what they are studying.

They begin their day early at Kosbad. They are up by 5-30 a.m. They bathe, dress and pray for an hour and are out in the fields by 6-30 a.m. before the sun is up. They work in the fields till 10-30 a.m. when they retire under the trees for their theoretical lessons. At these classes they are asked questions about the work in the field they had just been doing and they are free to have any of their difficulties solved.

At 11-30 a.m. they disperse for meals and rest and do not assemble again till two o'clock in the afternoon. For one hour they have spinning and are back in the fields till 5-30 p.m. Then follow games, prayers, meals — and a very enjoyable and hard-working day is done.

I saw them at work in the fields under the direction of the teachers, receiving practical training in improved methods of agriculture—nursery, horticulture, vegetable farming, compost-making and so on. They were so engrossed in their work and took so much interest in it that if I enquired about one thing, they would show me a hundred more beside it!

Near Kosbad are some adivasi villages—Bhonarpada, Liluckpada, Variapada, Zarli and others. Students of the school also go in to these villages and do uplift work among the villagers.

For instance, when I was there, they were busy convincing the villagers of Bhonarpada, only half a mile below Kosbad Hill, to cross Rhode Island Cocks with native hens. The school has undertaken to supply the big Rhode Island cocks to these villagers so that after the fourth generation, the poultry bred will be the large Rhode Island quality. The villagers sceptical at first, had eventually agreed to try it out.

But apart from these experiments, their more urgent need of proper water supply—they drink and wash from the same dirty pool of water—was being attended to by their being encouraged to dig wells from their own labour with all the rest of the equipment and material required for properly building the well supplied by the school. Besides once a year for four days, Adivasi leaders from surrounding villages, are called for a short course in community life and other improvements they could make in their village condition one such batch had just arrived when I was there.

A multipurpose society has also been started by the College at Kosbad. It is a small place, but it contains everything that the student or the villager might need for his daily requirements. The students themselves manage the affairs of the society.

In course of time, the Kosbad school expects to be able to stand on its own legs. From the sale of its produce, it has already started making about Rs. 30,000 yearly. And the figure is going up year by year.

This ideal institution however suffers from the absence of lights and a proper dispensary. Although a doctor does visit the place regularly, there is nothing available on the spot except first aid. No electricity is another problem awaiting to be tackled. Both are needed—and if a third requirement may be mentioned, a proper approach road from Gholvad. Though one or two bridges are in the course of construction, the entire strip of $2\frac{1}{2}$ miles from Gholvad station, running past such an attractive countryside scene deserves, to be put in better shape.

THE MAN OF THE MONTH

(*Continued from page 5*)

3 or 4 days later by weeding. Between November 16 and 19 there was a second weeding and earthing up operations. As a preventive against the late blight disease, paranox was sprayed on the crop. Earthing had to be repeated in the first week of December, because rains had washed away some of the soil near the roots. Between November 19 and December 8, the crop was watered thrice, and from the end of February 1952 till the time of harvesting, the crop was watered three times with a lotion of compost. The crop was harvested on April 6, and the yield was 735 mds. and 24 seers.

I asked Shri Jaipal, "It is all very well to undertake this heavy manuring to win a prize, but is it an economic proposition?" 'Most decidedly' joined the father and son in unison. "If you give us a little time, we will give you the figures."

The tiny notebook was produced again, rapid calculations were made of the cost of manure, fertiliser, labour and seed. The result was: expenses Rs. 700, income: Rs. 2750. The net profit therefore worked out to over Rs. 2000/- an acre.

I asked the young champion if he could give me in one sentence the secret of his success. Jaipal thought for a moment and then said in deliberate tones: "My father's guidance, green manuring, constant supervision, good seed and proper irrigation". Brother Yashpal Chandra, who had meanwhile joined us, said half complainingly that the efforts of the officers of the Agricultural Department, who assisted the potato growers at every stage seemed to be completely forgotten. Perhaps there was something in this, but who could assess the value of advice, but all scales would tip heavily in favour of 735 maunds and 24 seers of potatoes.

After a heavy breakfast, we all moved to the family holding of about 40 acres, most of which is under fruit orchards. The area is well served by canal and tube well irrigation, and as I moved among the mango trees heavily laden with the famous 'daseri' and 'chaunsa' varieties, I saw the water channels meandering through shady spots and open fields, under *lichi* and *loqat* trees, and along banks of berseem and small papaya plants. A fertile land, and plenty of water has made the orchard a veritable gold mine for lawyer Bireshwar Chandra. No wonder he is credited with the saying: "I have five sons, four work for themselves; the fifth, my fruit orchard, works for me. On the last I pin my greatest faith, for it will continue to feed me, even if the others don't."

In the evening, before I finished my visit to the Bireshwar family, came the pleasantest part of my stay, when the whole family, particularly the women and the little children turned out in their best clothes, keen to be photographed. It was a great occasion and the young and old were determined to make the most of it.

One last question I shot at young Jaipal Chandra, as I sipped my third cup of tea: "What will you do with the Rs. 10,000/- you will get as prizes?"

Pat came the answer "Buy more land and more fertiliser. Good land costs about Rs. 200/- a bigha in Bulandshahr". It could not be otherwise: he was in the grip of the power of the land; what was he that he should presume to say it nay?

THE PLACEMENT OF FERTILISERS

(*Continued from page 27*)

MODIFICATIONS AND ADJUSTMENTS

For sowing the seed and drilling the fertilizers, poras (Fig. I-A). (metal or wooden tube with funnel attached at the top), of about 2-inch diameter are fixed at outward angle to the frame of the horse-hoe with thin metal clamps (Fig. I-B) so as to provide sufficient space for 2-3 men to walk abreast when doing the sowings. The metal clamps allow further adjustments in walking space to be made, by simply bending them to desired angles.

The lower end of the pora is bolted on to a thin iron plate (Fig. I-C) about 14 inches long and 7 inches broad — bent to the shape of a U. The U-shaped iron piece is then fixed with the open end of U facing backwards in between the frame and the tine with the same bolts which secure the tine to the frame of the horse-hoe. The pora opens close to the back of the tine and into the space provided by the arms of U. This allows the seed and fertilizers to be dropped in position before the furrow gets filled up again.

If the side tines are desired to be brought closer than is possible with normal adjustments provided in the horse-hoe, then the bars provided to adjust the distance between the tines may be replaced by a single straight bar (Fig. I-B) so as to fix the distance between the tines to the desired width.

Again when the seed or fertilizers are to be sown deeper than is possible with the normal tines (Fig. I-G) or the adjustments provided in the horse-hoe, longer tines (Fig. I-F) to open furrow to the desired depth may be fitted up.

With the above simple modifications, horse-hoe has been very successfully used at Indian Agricultural Research Institute for the placement of fertilizer experiments on such crops as potatoes, maize, peas, etc.

COST AND MANUFACTURE

The cost of making these parts in the Institute's Engineering Division Workshop amounted to Rs. 13-15-6. The cost of material being Rs. 7-15-6 and labour charges Rs. 6. The parts are very simple, any village blacksmith can manufacture them quite easily.

WORKING

Before starting work, the tines are adjusted to open the furrow to desired width and depth by usual adjustments. The seed and fertilizers are then dropped through the appropriate poras. When the fertilizers are to be placed on one or both the sides of the seed row, the side poras are used for drilling the fertilizers and the middle pora for sowing the seed. When, however, the fertilizers are to be placed in the same row as seed, the side tines are removed and another tine with the attachments described above, is fixed to the middle bar of the horse-hoe in front of the seed row tine (Fig. I-E). The fertilizers are then dropped through the front pora and the seed through the back pora or vice versa if the fertilizer is to be placed ab[illegible] the seed row.

Uniform sowing of the fertilizers will [illegible]ely [illegible] the experience and skill of [illegible] doing the job. Our [illegible] shown that a [illegible] worker [illegible] soon [illegible] satisfactor[illegible]

HINTS TO THE FARMER

(*Continued from page 7*)

Time of sowing: For grain, both the crops, in Kharif, are sown with the break of monsoon from June to mid-July. Jowar for fodder may be sown under irrigated condition, from March onwards. Bajra for fodder is grown only in poor land and very deficient rainfall area, where *jowar* will not thrive well. Rabi *jowar* in South and Western India is sown from September to November. Timely sowing is very important. And as sowing period is limited to a few weeks before the break of the main S. W. monsoon it is very essential that the land be prepared quickly with the first shower of rain. Bullock drawn horse-hoe or cultivator will be of immense help in preparing the land quickly as it will cover 3-4 acres in a day as compared to .5 to .75 acres a day with a country plough.

Sowing and seed rate: For fodder, *jowar* is far more popular than *bajra* and is sown broadcast. Seed rate varies from 40-60 lbs. per acre. For grain, both crops are commonly sown by broadcast; seed rate being 16-20 lbs. for *jowar* and 5-10 lbs. for *bajra*. It is, however, advised that for grain purposes both the crops should be grown in rows 1′ apart and 6-9″ between the plants. As *bajra* tillers profusely, wider spacing of 9″ between the plants should be adopted. Row sowing will greatly reduce the expense of weeding, as bullock drawn implements can be employed instead of manual labour. Generally, no weeding will be necessary for crop grown for fodder but for grain crop 1-2 weedings may be necessary.

Varieties: The importance of variety has already been stressed under maize and you should ~~take the~~ earliest opportunity to discuss this and other points with your nearest ~~representative of Agriculture~~ Department. It is his job to help you and he will be happy to do so. However, some of the improved varieties of *jowar* and *bajra* are listed below:

Province or State	Jowar	Bajra
BOMBAY	Nandyal, Bilichigan, Fulgar white, Fulgar yellow, C-10-2 Jowar-8, B. P. 53, Melandi-35/1	207, 28-15
HYDERABAD	Kharif varieties:-Yellow, No. 75, 99, Selection 1, 19, Imphi (for fodder). Rabi varieties:-Parbani No. 3,5,8,10, P. B. 4 R.	Kanpur local
MADHYA PRADESH	Rabi varieties:-Ringni, Shaloo, Una-rlhi, Hirve, Bodkhe, Wakde, Gondhala. Kharif varieties:-Soanar, 123A, Ramkel	
MADHYA BHARAT	I. P. 3, M35-1, Gwalior 12-2, 7.,	Gwalior 2, Gwalior 5.
MADRAS	...s, Co_9, Co_{11}	Co_1, Co_2, Co_3, Hyderabad strain X 2
PUNJAB	...R, 5T, 4011.	A 1/3, T. 55, Type 11, 16.

... no manure is applied to ...stly grown under *barani* ... to give luxuriant growth while the restricted moisture in the rainfed soils may not be able to mature the crop. Under irrigation 5-10 cartloads of F. Y. M. may be applied with benefit.

Irrigation: It is very seldom that irrigation is applied to these crops, except when they are grown in small areas for grain. Where irrigation facilities are available they may be usually replaced by maize or some other Kharif crop.

Harvesting and after: For fodder *jowar* as well as *bajra* should be harvested when the crop is still green and the grain is in dough stage, i.e. in early stage of formation. Jowar should never be fed in young stage, i.e. before the earheads have fully emerged, otherwise, it may lead to Hydrocynic poisoning of cattle. The danger is still worse in years of drought. Jowar, if it has been sown early will give an excellent second cut and *bajra* will give two.

For grain the crop should be harvested when fully mature. In case of *bajra* the earheads mature irregularly and it will be necessary to harvest the mature heads in two or three lots.

Selection of seed: The same procedure as outlined under maize should be followed. In *jowar*, select normal plants free from disease bearing large size heads well filled with bold and round grains. In case of *bajra* give preference to long cylindrical well filled dense ears which mature at one time.

Pests and diseases: Although there are many diseases and pests of these three crops following few are the ones which are of serious nature. The most serious pests of these crops are the stem-borers. The young ones called caterpillars bore into the stem and cause the growing tip to dry off. In adult stage these caterpillars develop into moths. They can be controlled by the following methods:

(1) By light traps. Put shallow basin or "tasla" on a raised platform 2-2½ft. high. Fill the basin half full with water and put a little kerosene oil on the top to form a thin layer. In the middle of this basin place a brick. At night, place on the brick a lighted hurricane lamp. Keep the lamp lighted for the whole night. As the moths are attracted by light they will swarm round the light and get killed in the kerosene oil.

(2) These borers also attack sugarcane. Therefore, as far as possible avoid growing these crops near a sugarcane ratoon. Also plough up the stubble of maize, *jowar* and *bajra* as soon as possible after the crop has been harvested.

(3) At the first signs of the attack of these pests, i.e. drying up of the growing tips of the crop, pull out the plants and bury or burn them. Further spread will thereby be checked.

Of diseases, the serious damage is caused by "smuts". Instead of the development of the grain you may find that the ear is a black mass of spores and no grain formation has taken place.

The most practical method to control these diseases is to treat the seed with some fungicide. Agrosan G. N. has been found quite effective. Thoroughly mix Agrosan G. N. at the rate of 3 chataks per md. of seed in a drum just before sowing. This treatment will not only control most of the diseases which affect these three crops in young and later stages but it has also been found that the germination of treated seed is better and the crop shows more vigorous growth. Adopt this fungicide treatment as a matter of routine. It will pay you.

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INDIAN FARMING

Important

For immediate attention :

Subscribers Please :

We have posted renewal reminders to all those readers whose subscriptions expire with the current issue. It will be appreciated if we are advised of the renewal for the new Series Vol. II April 1952-March 1953 in time. All remittances should be sent by M. O. or crossed P. O. in the name of the Agents. In case of crossed cheques bank charges should also be included. Annual subscription remains Rs. 9/- while for six months Rs. 4/8/- may be sent. For Foreign subscribers the subscription is Rs. 9/- plus postage Re. 1/11/-.

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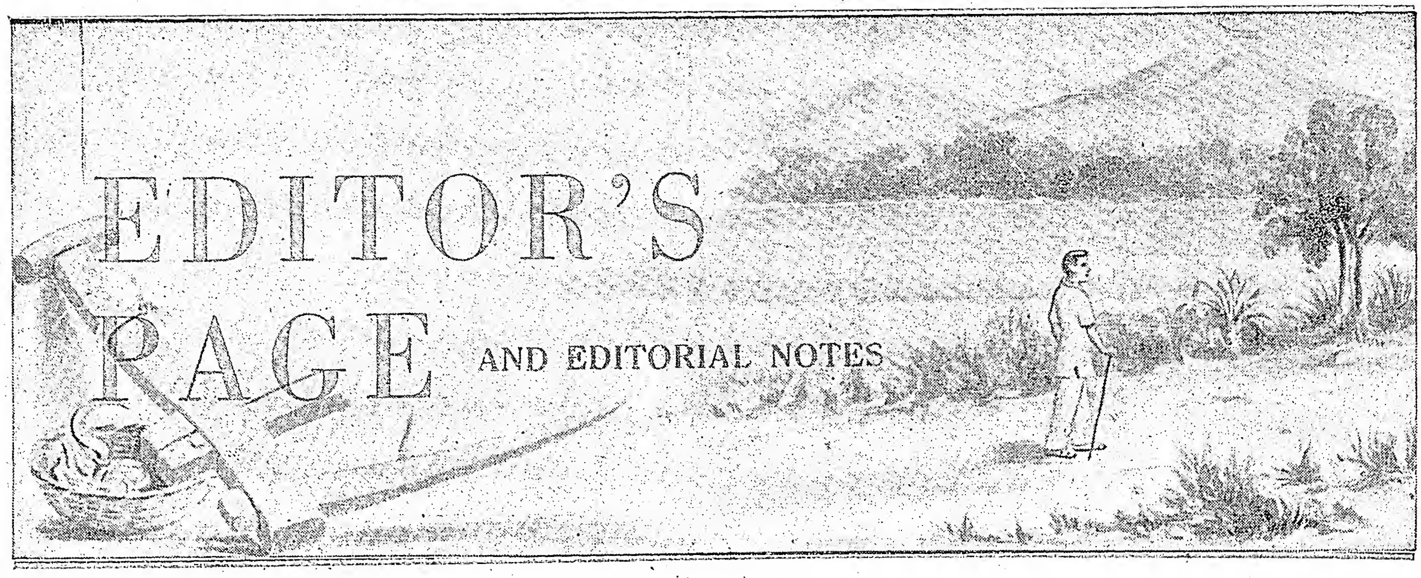


THE FIFTH PLATE

The Grow More Food Enquiry Committee has just submitted its report to the Government of India. This report was frank to admit the weaknesses in the Grow More Food campaign and to recognize the need for increasing efforts to meet the important targets of this scheme. The campaign is falling short of its goals. The Committee reported, " The integrated production programme has failed to arouse enthusiasm...........The food problem is a much wider one than mere elimination of food imports. It is the problem of bringing about such a large expansion of agricultural production as will assure to an increasing population progressively rising levels of nutrition...........The campaign for food production should be conceived as part of a plan for the most efficient use of land resources by the application of modern scientific research and the evolution of a diversified economy."

Perhaps, it was outside of the responsibility of this Committee to investigate the other side of the food problem, i.e., the geometrically progressive rise in the number of stomachs to be fed. We haven't met the food needs of our people by our domestic production. An increase in production will be needed, obviously, to meet these needs. However, a further increase will be needed each year to meet the demands of new population. It would be almost impossible to overestimate the importance now of educating the farmers on methods of increasing production and on the vital need for this increase.

In its report, the committee considered the place of the extension organization. The committee recommended that the village community can take up useful schemes of permanent improvements like excavation of channels, construction or repairs of village tanks ....on cooperative basis, and production of green manure, compost, improved seeds........The development of the cooperative movement for providing finances for joint ownership of agricultural machinery and for organizing supply services is also another important duty of the extension organization. The committee recommends that extension service should be set up all over the country within the shortest possible time—in any case within the next ten years.

Recent studies by the United States Department of Agriculture make our efforts here seem even more urgent. Scientists there claim that where 4 people are eating at America's tables today, there will be 5 in 1975. They claim further that producing at the current rate it will require a 100 million more acres of farm land to feed the extra population in the United States 25 years from now. It is obvious to these scientists that this much productive new land is not available, and that increased requirements must be obtained through increased production from the land now under cultivation. Americans in agriculture consider this a serious problem and are making plans for immediate steps to meet the threat of future food shortages. In view of the almost curious seriousness with which American authorities accept the predictions for 25 years hence, *Indian Farming* is preparing some estimates of India's requirements for 1975.

It is possible that this longer view should be given more emphasis and despite the current interest in growing more food, it is possible also that all-out emergency efforts should be made to correct the immediate situation.

The grow-more-food goals at present are realistic in that these goals aim at correcting an immediate and pressing shortage. But while we concentrate on the immediate threat, it may be well to prepare ourselves for confronting an almost impossible condition within the very near future, if current population trends continued here and in other food production areas. Look for more on this subject in an early issue.

AGRICULTURE IN PEPSU

PROPAGANDA WORK

Particular attention was paid by the district staff during this quarter to the eradication of *pohly* weed, which causes huge losses every year, removal of black smut, use of improved agriculture seeds, improved implements, formation of crop competition societies, repair of old wells, etc., etc. Extensive anti-rat campaign was also carried out in an area of 14,80,598 *bighas* or about 3 lakh acres in about 800 villages of different districts of the State.

An annual Agricultural Exhibition was held at Patiala from 16th to 20th March 1952 where subsidies amounting to Rs. 3,32,500/- for the installation of 380 new wells were given to the cultivators.

LAND RECLAMATION

About 212 acres of land were ploughed with tractors during this quarter and about 10 acres of scrub jungle was cleared of trees. Rabi crops were sown in reclaimed areas.

CATTLE FAIR SECTION

Twenty-nine cattle fairs were held during this quarter and income of Rs. 1,44,477 accrued to the State on account of these cattle fairs.

HORTICULTURE SECTION

During this quarter about 200 fruit trees of different kinds were budded and 6,670 plants were sprayed against mango hopper, meely bug, citrus phsylla and round pumpkin beetle in various orchards.

An experiment was conducted for the control of some most troublesome weeds which infest lawns and nursery plots. One ounce of Feroxone diluted with $2\frac{1}{2}$ gallons of water was sprayed upon the weeds. It was found that all the weeds except grass died within a period of 15 days.

ANNOUNCEMENT

Prizes are offered by the Indian Council of Agricultural Research for suitable articles on subjects relating to food and agriculture published in newspapers. The rules governing the award of such prizes may be ascertained from the Secretary, Indian Council of Agricultural Research, Jamnagar House, Hutments, New Delhi.

OUR COVER

SINDRI FERTILIZER FACTORY

The Ammonia Synthesis Tower with the overhead travelling crane for servicing Ammonia Converters. The Nissen Huts in the foreground are temporary departmental canteens

THE MAN OF THE MONTH

Mustard grows in abundance in Sugaon

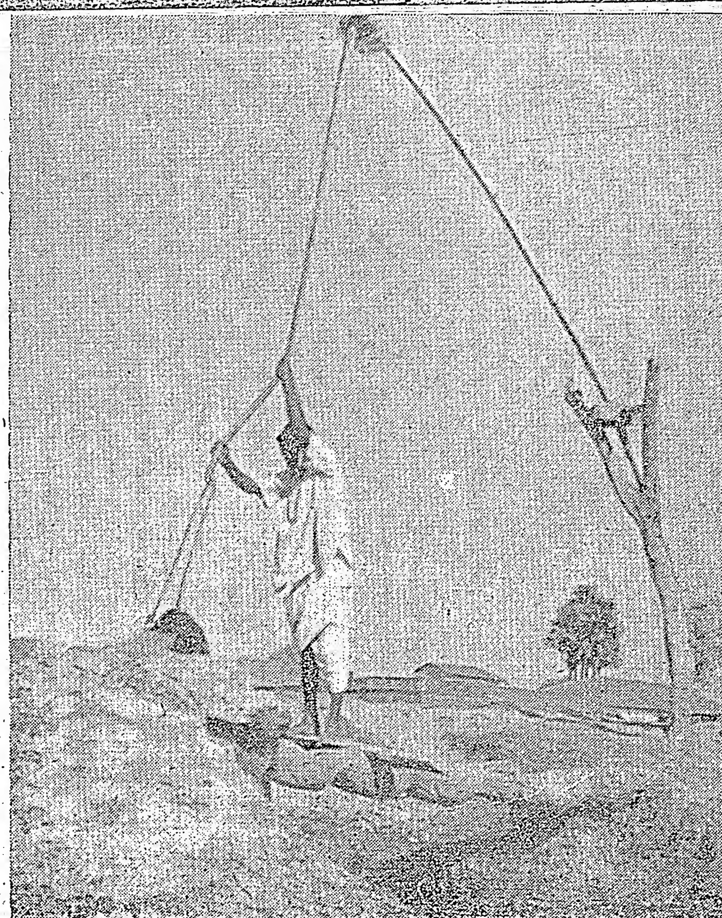
MEET Mohmad Ishaque

Md. ISHAQUE IS A RETIRED POLICE INSPECTOR AND NOW THE PRESIDENT OF THE SUGAON DEVELOPMENT SCHEME COMMITTEE

It was a fine morning; the sky was clear and all around fields were green presenting a very pleasant spectacle to anyone who is accustomed to wake up seeing dreary sights in a city, hearing all possible jarring noises and generally living without a whiff of fresh air. A few months back I was told about a small village called Sugaon in Bihar which I was told was getting ahead, "doing what", was something I was to find out for myself.

I got out of the train at a way-side station. I was met by a number of villagers and told to walk along to Sugaon a village without any roads. We had to walk down the pathways made through the fields and it took us nearly 30 minutes to reach the village of Sugaon. As we were nearing the village boundaries, I saw an imposing-looking old gentleman coming along swinging a stick and walking erect—so erect that but for the white moustaches one would think it was a walk of a much younger man. This was Mohmad Ishaque coming to do honour to the guests from far away come to visit the centre of activities reported to be something out of ordinary.

One of the biggest farms in the Development Centre



Irrigating the fields

MR. CHAIRMAN WAS A POLICEMAN

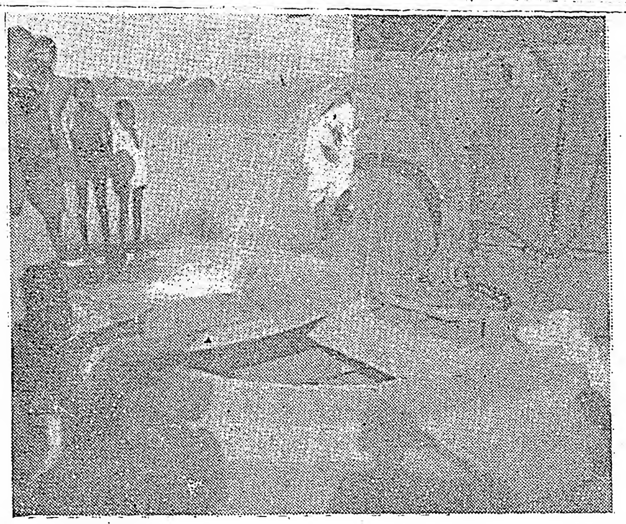
Sixty-three year old Md. Ishaque is a retired Police Inspector looking every inch a policeman who owns about 40 *bighas* of land. He has a small but well appointed house in the village and is full of enthusiasm for the planned development scheme—the scheme in which farmers themselves are interested because it is worked by the farmers themselves. Md. Ishaque is the President of the Sugaon Development Scheme Committee and his experience in handling people is standing him in good stead in getting utmost cooperation from his colleagues on the Committee as well as members of the general development committee. Aided by Sukhdeo Prasad Verma, Secretary of the Committee, Md. Ishaque is doing a very fine job of work which in my experience, is a unique experiment. In Bihar—noted for recurring scarcity conditions in the past—agriculture is taking rapid strides and Sugaon has been selected by the agricultural authorities for bringing within its orbit some 40 villages and 15 thousand people to provide organized irrigational facilities, experiment with manures, and with the cooperation of the farmers to set an example which would lead to all round improvement. Situated in the district of Zahanabad, Sugaon which is centrally placed with immense possibilities for improved irrigational facilities, has rightly been made the headquarters of the Sugaon Development Scheme, which embraces a total area of some 12,809 acres of which Sugaon itself provides a thousand acres.

FARMERS GET TO WORK

In accordance with the aims already elucidated above, the agricultural authorities have very wisely decided to re-kindle the spirit of initiative which the farmers are accused of having lost. Under the Scheme development experiments are being carried out on the farms which belong entirely to the farmers. There are hardly any government lands involved. All the equipment, labour, and outlay is provided by farmers. The government provides technical advice and guidance, and also arranges supplies whenever necessary. We can see at a glance that whereas the per acre 1948 yield was in the region of 4 to 5 maunds in 1949-50, the yield had steadied to 8 to 9 maunds and now it has gone up to 15 to 16 maunds on an average. Before the development scheme was started there was no wheat in the area and it is only since 1948 that the area has been able to grow good wheat. Even potatoes give an average of 300 md. per acre and Md. Ishaque has taken interest in developing orchards, one of which belongs to him and provides a picturesque setting in farms which surround it. The villagers in Sugaon have been trying to improve irrigational facilities and among one of the major achievements is building of bunds on the Jamuna river. By their own labour and planning they have built a major bund diverting part of the waters for the Sugaon fields. However, they have a complaint to make regarding the supply of water from Sulenda bund which they say is not supplied to them in quantities required by them. Taking into account the entire development scheme of which Sugaon forms but a part I was told by Sukhdeo Prasad Verma that the Chariari irrigation scheme will also help them immensely.

THE AREA AND THE PEOPLE

Although Sugaon is the king-pin around which all the activities are projected, it appears that the village is entirely isolated and there is no connecting link with the main road. The Sugaon villagers have to walk about a mile and a half along side the bunds to reach the station or the main road. They are prepared to construct the road if material is available and technical advice given by the P. W. D. With 40 villages and 15 thousand people residing in the development area naturally the farmers are interested in education, and I was told that here they had registered some advance in that they have two middle schools, three girl schools, a high school, and some ten private schools catering to the needs of the villagers.



There are seven such pump sets that make irrigation easier

BACKGROUND

The main object of the development centre was to encourage the villagers to work on cooperative basis and help the agriculturists in achieving better yields and make available to them technical know-how about the most modern methods of agriculture thus enabling them to obtain better returns from their farms. When the work was first started in the year 1948 it was known as Sugaon Development Centre. Although now it is generally known as Sugaon intensive Agriculture Block. In this area crop used to fail totally before 1948 due to bad irrigational facilities and in other areas its average yield never exceeded 4 to 5 maunds per acre. In its four years of working not only the yield has been increased 3 times, but the villagers are now making huge quantities of compost, repairing tanks and wells and are looking after pumps, and arranging distribution of improved seeds. This has changed the entire crop pattern. The area has also taken to use of fertilizers, and thanks to an excellent irrigation system which they have built up, when the monsoon had practically failed in 1951 the villagers could be assured of three crops, in one field, by the use of seven pumping sets from 50 wells sunk in the area. Thus, thanks to the united efforts of the government and the people in which the people themselves are playing a major part. Sugaon has become a matter of faith with the villagers in the area and an inspiration not only to Bihar, but to farmers outside Bihar as well.

As the scheme progresses its energetic Secretary is convincing the participants of the benefits of cooperative farming and they told me that when I visit the area next there may be a cooperative already in action. Here is good luck to these progressive farmers !

—PUSHKAR OZA

CORRIGENDA

July 1952 issue of the 'Indian Farming', page 28, para 1, line 6 from top, please read "At present only about 14.5 per cent of the people in this country can read and write. ....instead of five per cent etc., etc.


Playful hands get dirty . . .
and where there's dirt there's *Danger* from germs!
Wash often with
LIFEBUOY SOAP
it protects you from the germs in dirt!
L. 108-193

Hints to the farmer :

Wheat AND Barley

By **S. SEN,** Agronomist,
Indian Agricultural Research Institute, New Delhi.

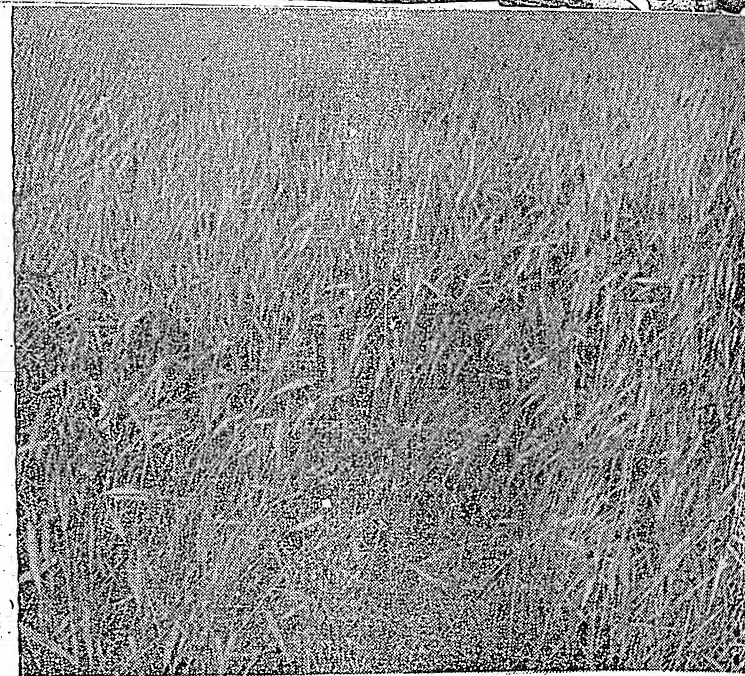
WHEAT

THE yield of wheat is influenced to a great extent by the climate, physical character of the soil and diseases, especially the rusts. The short growing season obtaining for this crop in India, which still dwindles as one moves from north to south or from north-west to north-east, demands that only those varieties of wheat which would mature within this period should be grown. In selecting the variety, due considerations have also to be paid to the high and low moisture contents of the soil, rainfed or irrigated conditions, capability of the variety to stand manuring and disease resistance, besides the main factors of yield and quality of the produce.

GROW IMPROVED VARIETIES

Notwithstanding such difficulties, the problem has been handled with considerable success by the wheat breeders of this country. A large number of suitable types have been bred to meet the requirements. A list of the important ones is given below :—

Punjab, Pepsu, Himachal Pradesh and Delhi.—Humid conditions : C. 250, C. 265 and C. 280.



In Sanand Taluka of Ahmedabad District successful sowing of wheat seed Niphad No. 4 supplied by the Agricultural Department was obtained during the sowing season of 1950

Rainfed conditions : 9-D, C. 250, C. 217, N. P. 4, N. P. 710 and N. P. 775.

Irrigated conditions : C. 591 (standard variety), C. 518, C. 230, C. 228, C. 409, 8-A, N. P. 165, N. P. 710 and N. P. 775.

Late sowing (irrigated) : C. 228 and C. 260.

Drought-stricken south-eastern districts : C. 591, C. 281 and C. 282.

Hilly tracts: N. P. 80-5, C. 253, Ridley and N. P. 770.

Rust resistant (partial) : N. P. 4, N. P. 12, N. P. 165, N. P. 710, N. P. 715, N. P. 718, N. P. 720, N. P. 760, N. P. 770, N. P. 775 and C. 253.

Rajasthan and Madhya Bharat.—N. P. 710, N. P. 718, N. P. 758, N. P. 771, 8-A, C. 518, C. 591, Pissi and Malwi types.

Rust resistant (partial) : N. P. 710, N. P. 718, N. P. 758 and N. P. 771.

Uttar Pradesh.—Hilly tracts (irrigated) : N. P. 4 and Padova I.

Hilly tracts (rainfed) : N. P. 4, C. 591 and Padova II.

Irrigated conditions : N. P. 12, N. P. 52, N. P. 125, N. P. 165, K (Kanpur) 13, C. 591, 9-D and AO. 68.

Rainfed conditions : N. P. 12, N. P. 52, N. P. 125, K. 46, K. 13, C. 591, C. 409, Bansipalli 808, Kathia and Bansi.

Other varieties : N. P. 710, N. P. 720, N. P. 737, N. P. 758, N. P. 760, N. P. 761 and N. P. 775.

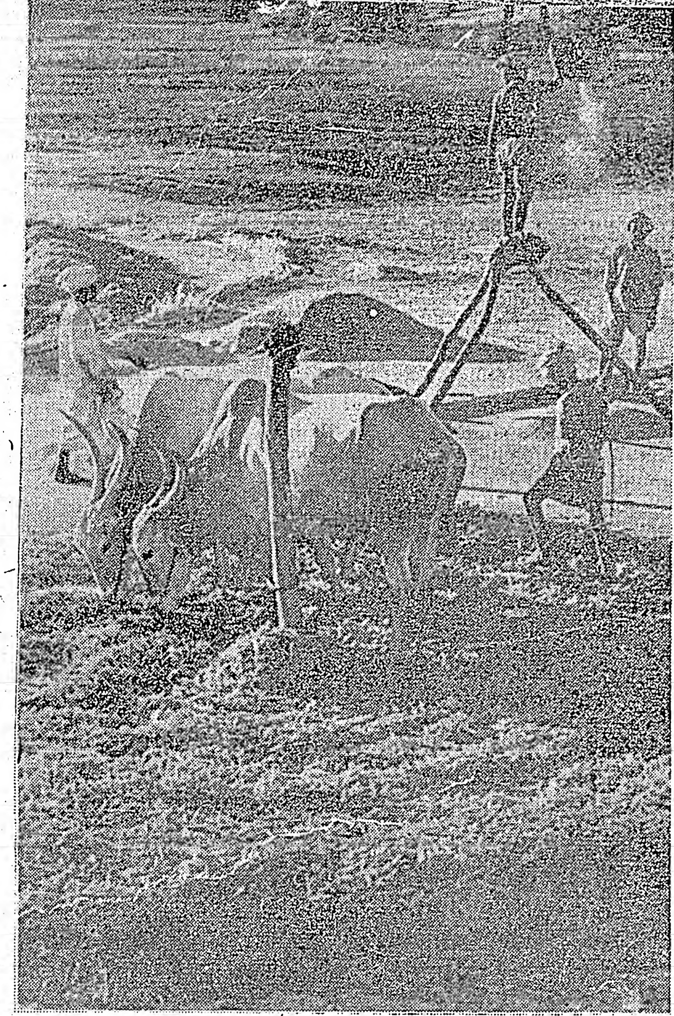
Rust resistant (partial) : N. P. 4, N. P. 12, N. P. 165, N. P. 710, N. P. 720, N. P. 737, N. P. 758, N. P. 760, N. P. 761 and N. P. 775.

Bihar and Orissa.—N. P. 4, N. P. 12, N. P. 52, N. P. 165, N. P. 710, N. P. 718, N. P. 737, N. P. 745, N. P. 758, N. P. 760, N. P. 761, N. P. 762, N. P. 764, N. P. 775, No. 310 and No. 319.

Rust resistant (partial) : N. P. 4, N. P. 12, N. P. 165, N. P. 710, N. P. 718, N. P. 737, N. P. 745, N. P. 758, N. P. 760, N. P. 761, N. P. 762, N. P. 764 and N. P. 775.

West Bengal.—N. P. 52, N. P. 80-5, N. P. 710, N. P. 760, Gangajali 50 and Jamali 24.

HARVEST TIME IN PUNJAB
After the crop is cut, women collect ears of wheat



A SOUTH INDIAN VILLAGE SCENE
The age old method of letting the oxen thresh out the grain with their feet is still in use in some parts of South India

Rust resistant (partial): N. P. 710 and N. P. 760.

Madhya Pradesh.—Irrigated conditions: AO. 13, AO. 68, AO. 85, AO. 88, AO. 90, A. 113, A. 115, and N. P. 100.

Rainfed conditions: AO. 49, A. 113, A. 115, EB. 76 and N. P. 4.

Other varieties: Howrah 116, A. 112, N. P. 52, N. P. 80-5, N. P. 111, N. P. 114, N. P. 710, N. P. 758, N. P. 771, and N. P. 775.

Rust resistant (partial): AO. 49, AO. 68, A. 115, No. 76, No. 148, No. 267, Hybrid No. 281, Cross No. 3712, Cross No. 3729, N. P. 4, N. P. 52, N. P. 100, N. P. 101, N. P. 710, N. P. 758, N. P. 771, and N. P. 775.

Bombay.—Gujerat: Dhola Katha, Rata Katha, Gulab, N. P. 4, Niphad 4, Wagia, Chandausi and Popatia.

Deccan: Bansi, Baxi, Shet Parner, Motiya, Vijay, N. P. 4, Niphad 4, Mondhya and Khapli.

Karnatak: Bansipalli 808 (Jaya), Karnatak local red.

Other varieties: Bansi 168, Bansi 224, and N. P. 710.

Rust resistant (partial): N. P. 4, N. P. 710, Niphad 4, Kenphad 21, Kenphad 25, Kenphad 28, and Kenphad 32. It will be seen that the list is a fairly long one and the local department of agriculture should be consulted regarding the best variety for a particular area.

GOOD PREPARATORY CULTIVATION IS NECESSARY

A very careful attention has to be given to the preparation of the seed-bed so as to conserve sufficient moisture for uniform germination of seeds. The initial ploughing should be done by a soil-inversion plough, succeeded by frequent ploughings and cross-ploughings by a *desi* plough (non-inversion), followed by beaming after each operation, till a fine seed-bed is prepared. Under rainfed conditions, the number of ploughings required is normally more than that under irrigated conditions. Where wheat is grown after a summer fallow, the initial ploughing should be given in the hot weather to get rid of the pernicious weeds.

There is a good scope for mechanization of cultivation which would result in better control of weeds, timely cultural operations, extension of cultivated acreage and lower cost of production.

DRILL YOUR SEED

The sowing should be done in rows, 9-12 inches apart, by drilling, deeper sowing ($2\frac{1}{2}$—3″) being resorted to under rainfed conditions and shallower sowing ($1\frac{1}{2}$—2″) under irrigated conditions. A more uniform germination is assured by drilling the seed than by sowing behind the plough.

SOW AT THE RIGHT TIME

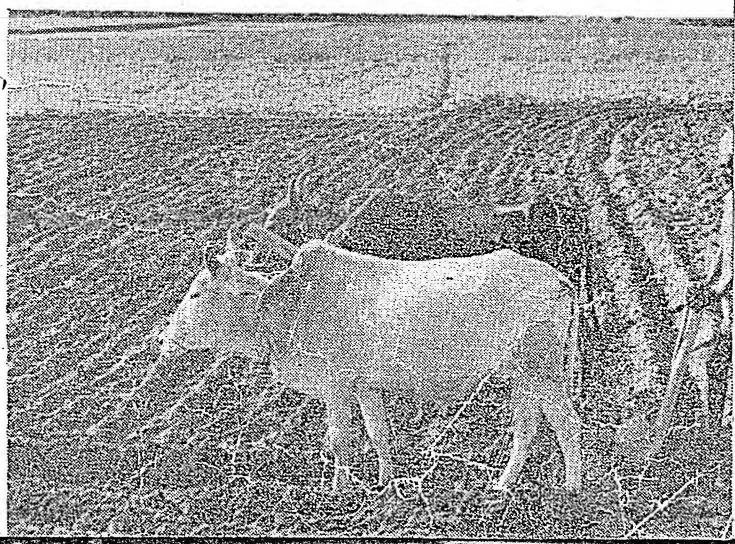
Early sown wheat, when the soil is still warm, is liable to be damaged by white ants. On the other hand, avoid late sowing which reduces the yield by the incidence of rusts and premature drying of the crop. The optimum time for sowing is from the middle of October to middle of November in the plains. In hills, it begins in the middle of September.

ADJUST THE SEED-RATE

The seed-rate usually varies from 20 to 50 seers per acre. It should be carefully adjusted to low or high rates, according to the rainfed or irrigated conditions, high or low tillering capacity of the variety, optimum or late sowing and fertility of the soil, in order to get the best result.

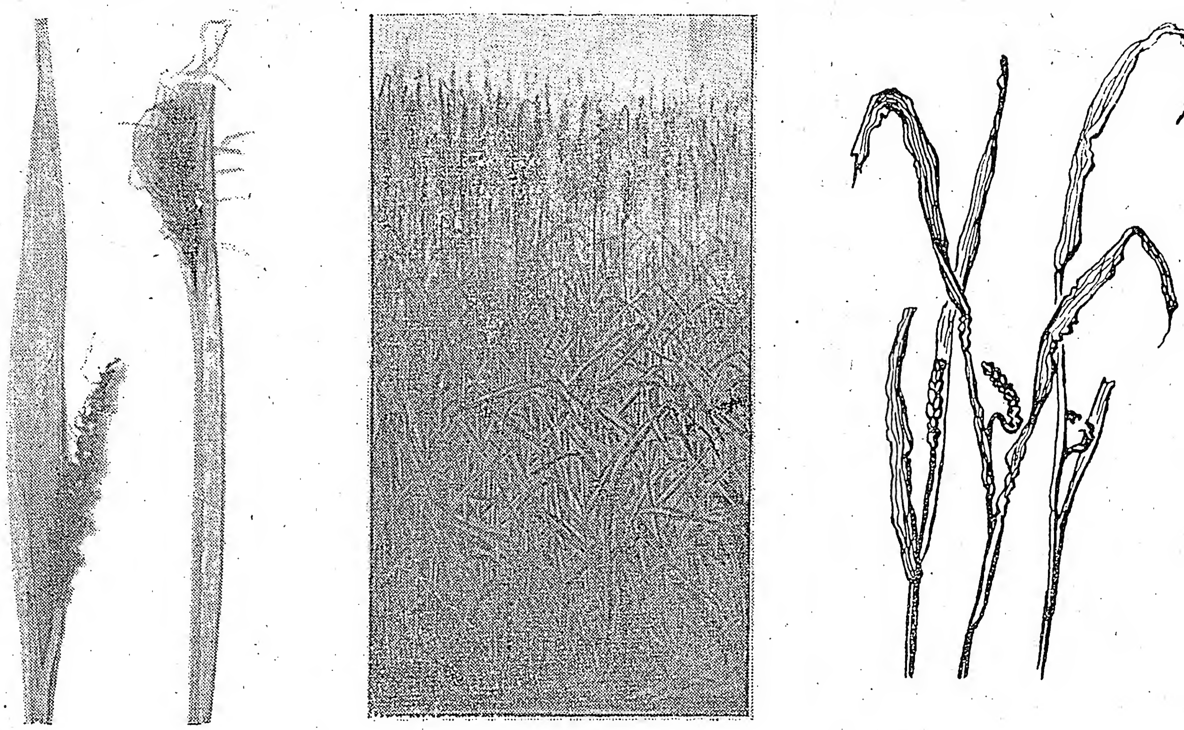
TREAT THE SEED BEFORE SOWING

Seed treatment (described later under diseases) should be considered a sound cultural practice which will enable the farmer to protect his crop against seed- and soil-borne diseases and thus give the crop a chance to grow and produce better than otherwise.



RURAL BIHAR
Bihar peasant and his pair. The entire Bihar countryside, specially in the plains, is intensively cultivated. The main crops are rice, wheat, pulses, sugarcane, oilseeds and tobacco

THE VARIOUS DISEASES WHICH CAUSE CONSIDERABLE DAMAGE



Loose smut — *Rusts* — *Tandu*

APPLY NITROGENOUS MANURES AND FERTILIZERS

Considerable increases in the yield of wheat can be effected by proper manuring. Green manuring should be practised wherever possible. The organic manures should be applied 4-6 weeks before sowing, while nitrogenous fertilizers applied just before sowing for the unirrigated crop and half before sowing and half as top dressing with first irrigation for the irrigated crop. The manuring schedule for the different parts of India is briefly indicated below :—

Punjab, Pepsu, Himachal Pradesh and Delhi.—

(1) Ammonium sulphate or nitrate of soda 21-40 lb. N per acre.
(2) Niciphos II 10-30 lb. N per acre.
(3) Castor cake 75 lb. N per acre.
(4) Farmyard manure 60-150 lb. N per acre.
(5) Green manuring with sannhemp or *guar*.

Uttar Pradesh.—(1) Ammonium sulphate 10-50 lb. N per acre.
(2) Nitrate of soda 12-18 lb. N per acre.
(3) Oilcakes 50-100 lb. N per acre.
(4) Farmyard manure 60 lb. N per acre.
(5) Compost 80 lb. N per acre.
(6) Green manuring with sannhemp.

Bihar and Orissa.—(1) Ammonium sulphate or nitrate of soda 15-25 lb. N per acre.
(2) Farmyard manure 20 lb. N per acre.
(3) Mustard or castor cake 20 lb. N per acre.
(4) Green manuring with sannhemp.

Bombay, Madhya Pradesh and Madhya Bharat.—

(1) Ammonium sulphate or nitrate of soda 5-20 lb. N per acre.
(2) Niciphos II 15-20 lb. N per acre.
(3) Farmyard manure 10 lb. N ammonium sulphate 10 lb. N per acre.
(4) Oilcakes 6-10 lb. N ammonium sulphate 10 lb. N per acre.
(5) Green manuring with sannhemp.

WEEDING AND HARROWING ARE BENEFICIAL

The crop needs weeding at the early stage of the crop to effect a good stand. For the irrigated crop, this can be done satisfactorily by light harrowing.

JUDICIOUS IRRIGATION ENSURES HIGH YIELDS

The wheat crop should be irrigated to ensure high yields. This should be done at the proper time, viz. at the tillering and full bloom stages, provided the winter rains are not adequate then. About 3-4 irrigations are needed in years when winter rains fail. Late-irrigations should be avoided.

GROW WHEAT AFTER *KHARIF* FALLOW

A high outturn is invariably obtained when wheat is grown after a *kharif* fallow. Short duration leguminous crops like *mung* and *urid* for seed or cowpea fodder may be grown with advantage. As mentioned before, green manuring with sannhemp or *guar* has given encouraging results.

HARVEST THE CROP WHEN RIPE AND DRY

The crop should be harvested when it is perfectly ripe and dry. Harvesting and threshing should be completed quickly to avoid loss which may be caused by fire, rain, storm, etc. In order to maintain purity of varieties, all rogues should be taken out before harvest.

AVOID LOSS IN STORAGE

The wheat grain should be stored under perfectly dry conditions. Before storing, the rooms and old gunny bags should be disinfected with D. D. T. or Gammexane against pests of stored grains. Fumigation by hydrocyanic acid gas (being poisonous, this should be done by those acquainted with the method) is also effective for this purpose.

PROTECT THE CROP AGAINST DISEASES AND PESTS

The various diseases which cause considerable damage to the crop are : (*i*) rusts, (*ii*) loose smut, (*iii*) flag smut, (*iv*) root rot (*v*) bunt and (*vi*) *tandu*. It is recommended to grow rust resistant types of wheat, wherever possible, to escape heavy losses caused by rusts in India. The control measures against other diseases are as follows :—

Loose smut.—Solar or hot water treatment of the seed to be done in May-June and rogueing of the smutted plants in January-March.

Flag smut and root rot.—Seed treatment with Agrosan GN at 4 oz. per maund of seed before sowing.

Bunt.—Dusting the seed with copper carbonate.

Tandu disease.—Removal of diseased galls from seed grain by floatation before sowing.

The major pest of the wheat crop is stem borer. It can be controlled partially by destroying the affected plants. White ants which attack the wheat plant in its early stage can be controlled by irrigation.

BARLEY

The area under barley cultivation is concentrated in Uttar Pradesh, Bihar, Rajasthan and the Punjab owing to climatic limitations. This crop is usually grown in fields having light soil and lacking in irrigational facilities, where wheat cannot be raised successfully. Given proper attention in respect of introducing improved varieties, level of farming (including irrigation) and control of diseases, the yield of barley can be enhanced considerably.

GROW IMPROVED VARIETIES

Numerous high yielding, disease resistant varieties of barley have been evolved for different tracts. A list of more promising ones is given below :—

Punjab, Pepsu, Himachal Pradesh and Delhi.—T. 4, T. 5, T. 152, T. 155-B and N. P. 13.

T. 4 and T. 5 are also suitable for malting and brewing purposes.

Rajasthan and Madhya Bharat.—T. 4, T. 5, and N. P. 13.

Uttar Pradesh.—Unirrigated : K (Kanpur) 251.

Irrigated : 300 A.

Other varieties : N. P. 21, T. 20, K. 74, K. 84, K. 85, K. 86, K. 94, K. 95, K. 285 and K. 259.

K. 251 is also good for malting purpose.

Bihar & Orissa.—N. P. 21.

West Bengal.—N. P. 21.

(*Continued on page 22*)

"Grow Your Own Food"

RAVALGAON'S UNIQUE EXPERIMENT IN CO-OPERATIVE FARMING AND SELF HELP

By **GUNDU RAO**

IT is common knowledge and perhaps universal experience that the greatest problem facing our country today is food shortage. Several parts of the country are threatened with famine and starvation in spite of the 'grow more food' campaign and the added imports. Valuable foreign exchange which could be utilized for various nation building activities is being freely spent to avert the crisis threatening the country.

The President's garden and those of the Governors are brought under the plough. The Premier often appeals to the people to plant food crops in their gardens and even in tin pots on roofs.

RAVALGAON

In spite of the best efforts the workers at Ravalgaon could not get their food requirements. Such grains as could be obtained were hopelessly inadequate and of very poor quality. The workers found it difficult to leave their work and move out hunting for food in the villages. The position became serious and many of the workers and their families were starving. Efficiency fell falling and the situation became alarming.

NEW EXPERIMENT

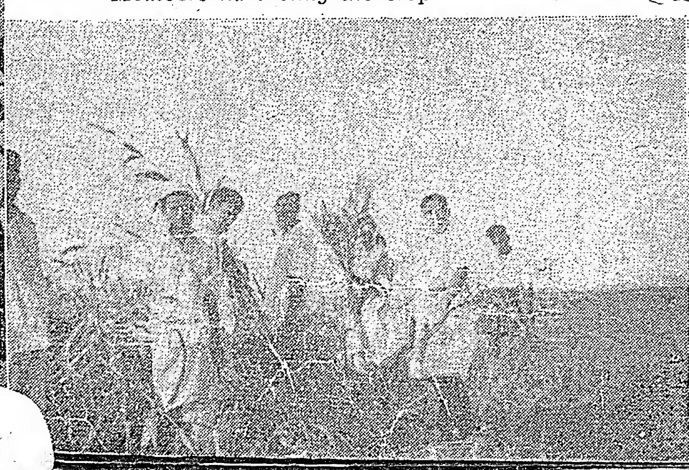
The situation depicted above demanded a solution. Production of more food somehow was the only solution. Sufficient land was available, but the means and manual effort were lacking. It was obvious that what was required to produce more food was human effort. The food position was so serious that the workers were prepared to work during their spare hours and on holidays and devote all their available extra effort if, by that, their food problem could at least be partially solved. What was required was to work a scheme of food production utilizing this extra effort.

The Scheme that was evolved consisted of a voluntary cooperative land army of workers at Ravalgaon. This army of workers was to take available land that would otherwise be fallow, plough it, manure it and do all the other operations of sowing, weeding, watching, irrigating, harvesting and finally threshing the crop. Such produce as would result was to be equally distributed among the members of the team.

MANAGEMENT SUPPORTS THE SCHEME

The management of the Ravalgaon Sugar Farm Ltd. have from

Members harvesting the crop



Members separating ear-heads

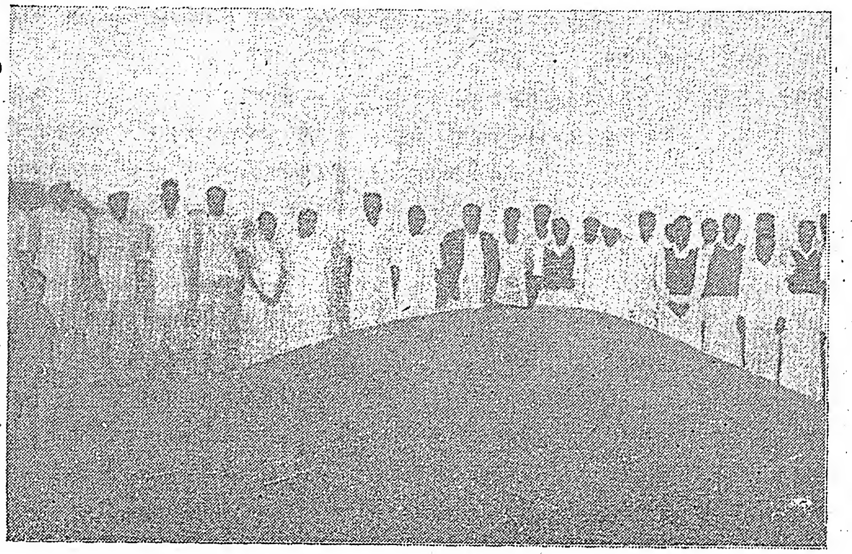
the beginning appreciated the difficult food position at Ravalgaon, and have helped the workers in many ways. When, therefore, the above scheme of cooperative effort and self help was put up before the Director, it won his appreciation and full support. It was his experience that in a condition of food scarcity, mere increasing of wages or allowances will not be of real help to the workers, but would on the contrary increase the level of prices in the locality. He, therefore, appreciated that this scheme would give the workers real relief in their food requirements.

THE GOVERNMENT AGREES

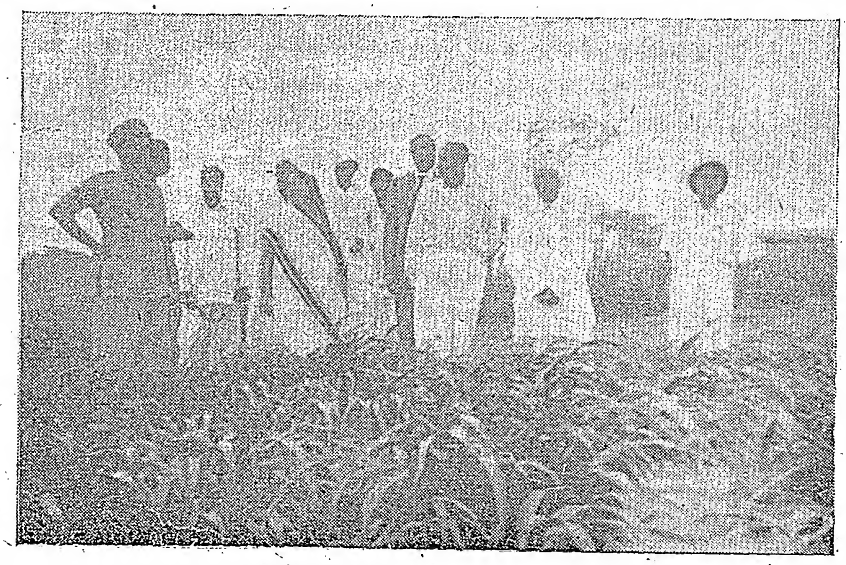
In view of the existing levy system of Government, the workers entertained the fear that at the end of their efforts the grain produced by them would be taken away under levy by the Government. It was, therefore, necessary to get an assurance from the Government that this extra production by the workers would be allowed to be used by the workers for their families. It was explained to the Government that this scheme was new in so far as it involved productive effort from a worker to increase food production quite apart from his normal productive effort in the factory. The best incentive to a worker, who is facing starvation in spite of his normal work is to assure him that this extra effort will give him the food he is so much in need of. It is gratifying to record that the Government appreciated the importance of this new experiment and readily agreed to allow the workers the benefits of their produce only on one condition that so long as their produce lasts, the workers will not get any Government supplies. This was quite satisfactory an assurance to the workers to go ahead with their productive work.

THE TEAM IS FORMED

For carrying out this experiment a team of 105 members was formed in the first instance. The team consisted of people from all ranks of workers, e.g., the Chief Chemist, Farm Manager, Accountant, Engineers, Chemists, Office Clerks, Supervisory staff and labour on the factory and farm. The pay scales of the staff were between Rs. 1,500 to Rs. 45 p.m. Though there were more members willing to join the team, it was restricted as the experiment was the first of its kind. Though the team consisted of members drawn from various ranks in the factory, they were all equal as farm workers in the field. All types of work were done by the lowest as well as the highest.



Heap of Bajri grain produced

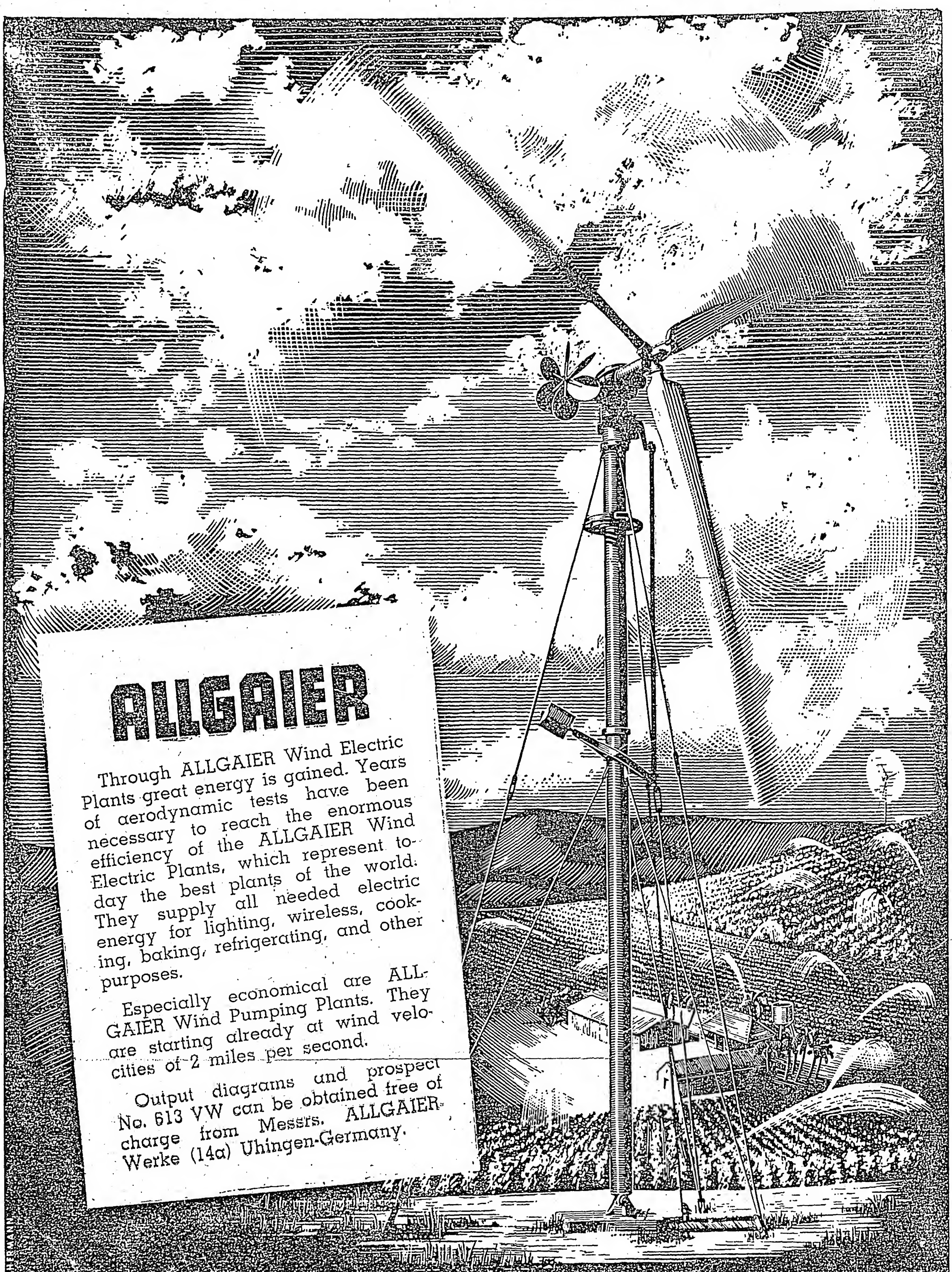


Some visitors to the cooperative farm

THE SCHEME IS PUT INTO OPERATION

The cooperative team took from the management 68 acres of land. Of this 62.1/2 acres were arranged for *bajri* and 5.1/2 acres for *kulti*. The operations were started sometime in July, 1951. The preparation of the land, sowing, weeding, manuring, watering, watching the crop, harvesting, stacking, threshing, separating and cleaning the corn, bagging and distribution were all done by the members of the team from the beginning to the end. The area under cultivation was divided into convenient blocks and the team sub-divided into groups, each group being given charge of a block. It was the responsibility of each group to do the work entrusted to them and a healthy spirit of cooperative and productive work developed. The members actually enjoyed the work and obviously there was a universal feeling of improved health

(*Continued on page 24*)



Sole Agents for India :

MESSRS. HANSA ENGINEERING COMPANY,

Wadia, Charity Bldg., 12, Bell Lane, Mahatma Gandhi Road, Fort, Bombay-1, India.

VILLAGE EXTENSION WORK

By **DOUGLAS ENSMINGER**

(*Continued from July Issue*)

RESULT DEMONSTRATION

The village extension worker who takes the time to organize a number of well planned result demonstrations for each practice being recommended in the village will be a wise village worker. A result demonstration is local proof that the recommended practice will work in the village and that village people can do it and profit from the practice.

Strong Points

1. Furnishes local proof of the desirability of establishing a recommended practice.
2. Is an effective method for introducing a new project.
3. Appeals to the eye and effective in concerning those who question the practice.
4. Provides a good source of information for meetings, news items, pictures, radio talks, etc.
5. Furnishes cost data and other basic information of use in revising the programme.
6. Yields a high rate of "takes" to "exposures."
7. Aids in developing local leadership.

Limitations

1. Finding a satisfactory demonstrator is often difficult.
2. Sometimes arouses jealousy of other farmers because of the number of visits of the agent to the cooperating farmer.
3. Affected by many un-controllable factors such as weather.
4. Lessens the effectiveness of other extension methods when unsuccessful.
5. Is not adaptable to many kinds of subject matter.
6. Requires considerable time to complete and to make results available after completion of demonstration.
7. Requires a relatively large expenditure per practice changed.

Tips which will be helpful in using the result demonstration

1. Do not attempt to discover new truths, but rather to prove the adaptability to local situations of those discoveries already made by research agencies.
2. Use in teaching certain phases of subject matter which do not lend themselves well to other methods.
3. Use local illustrations of good practices rather than result demonstrations whenever possible in order to save time and extension effort.
4. Place emphasis on quality of the demonstration rather than on the number of demonstrations conducted.
5. Do not repeat demonstrations needlessly.
6. Plan the project to prove or illustrate a definite practice or series of practices recommended for adoption by the community.
7. Obtain cooperatively minded, reliable demonstrator, located on a well-travelled highway.
8. Obtain new demonstrators from time to time.
9. Have the demonstration of sufficient size to command respect.
10. Mark the demonstration as soon as results are evident.
11. Insist that definite and detailed records, including costs, be maintained.
12. Hold meetings at demonstrations, to study progress and results, and to disseminate information.
13. Use material from result demonstrations in connection with meetings, newsletters, pictures, radio talks, etc.
14. Analyze the reasons for failure of a demonstration and use results for teaching purposes, relating the causes to the failure.

Note : The wise village worker will organize tours to assure as many people as possible with all the demonstration.

PERSONAL VISITS WITH VILLAGERS

Personal Visits to the villagers farm and home is a very useful method in getting acquainted and gaining the confidence of the people.

Strong Points

1. Gives village worker first-hand information regarding village problems and activities.
2. Develops goodwill.
3. Establishes confidence in village worker.
4. Contributes to selection of better leaders and relations.
5. Stimulates interest and increases effectiveness of Government services and villagers.
6. Furnishes material for news service.
7. High ratio of "take" to "exposure."

Limitations

1. Heavy consumer of village worker's time which limits influence.
2. Limited contact compared with certain other methods.
3. It is not always possible to make the visit at an opportune time of day.
4. Neighbours not visited may be disappointed and accuse village worker of favouritism.
5. Tendency to visit some homes and farms repeatedly.

Some suggestions and tips about use of personal visits

1. Have a definite purpose for the visit.
2. Scatter visits to more and different farms, including all income groups, families with children, and all parts of the village.
3. Be considerate of time of the farmer and his family.
4. Use visit to reinforce other methods.
5. Use visit to reach those who are difficult to reach with other methods.

6. Arrange a schedule of visits to save time and expense.
7. Leave clear impression of the object of your visit.
8. If visit is a service to the family, it should also be made educational.

GENERAL MEETINGS

To effectively reach and serve the largest number of people, village extension workers must utilize to the maximum general meetings as a method.

Strong Points

1. Reaches large numbers of people.
2. Adapted to practically all lines of subject matter.
3. Make high quality programme practicable and financially possible because a relatively large group is reached.
4. Affords opportunity for discussion and questions.
5. Facilitates action through group psychology.
6. Promotes personal acquaintance between village worker and people.
7. Provides change in environment and worth-while social contacts.
8. Yields high ratio of "takes" to "exposures."
9. Accomplishes change in practice at low cost.
10. Serves as news-creating agency and thereby stimulates publicity.

Limitations

1. Meeting place and facilities not always adequate.
2. Circumstances beyond control of village worker, such as conflicting attractions and weather, often result in small attendance.
3. Subject matter frequently difficult to present because of mixed group.
4. Teaching value minimized because of some members of audience are not receptive.
5. Amount of night work required of village worker is often excessive.
6 Meetings which are poorly arranged or conducted may have far-reaching unfavourable effects.

Suggestions for Use

1. Hold more meetings in daytime when practicable to reduce number of evening meetings.
2. Avoid conflict with competing attractions and rush periods of farm work.
3. Select meeting place which will provide suitable lighting, seating arrangement, heat, ventilation and other necessary facilaties.
4. Hold meeting within convenient distance of those expected to attend.
5. Plan meeting early in order that preliminary arrangements may be made and adequate publicity may be given.
6. Announce meeting and other methods to assure all interested people will know of meeting, circular letters, local leaders.
7. Encourage participation of local people in arrangements and programme.
8. Inform speaker regarding local conditions, and suggest subject matter be adapted to local needs.
9. Conduct meeting in accordance with a definite, well-organised plan:
   (*a*) Start promptly and close on time.
   (*b*) Focus attention on central theme.
   (*c*) Permit discussion yet move progressively toward desired action.
   (*d*) Use appropriate illustrative material.
   (*e*) Take advantage of group psychology.
   (*f*) Employ appeals that arouse interest, create desire, and stimulate action.
   (*g*) Insure definite action while interest is at height.
10. Arrange for suitable follow-up work, including publicity about the meeting held.

LOCAL LEADERSHIP

The effectiveness of the village extension worker will be multiplied by the number of non-paid voluntary villagers who can be trained and guided in assuming numerous local leadership responsibilities.

Advantages

1. Local leaders themselves can better explain many needs and improved practices to villagers.
2. Develops abilities of leaders' produces self-confidence and satisfaction.
3. Provides permanent leader in the village who is local authority on subject.
4. The good standing of village leaders gives prestige of village extension work.
5. People ordinarily accept a theory best from a local person who has given it a practical test.
6. Local leadership developed through extension carries over into other village activities.
7. Increases the number of village contacts and makes possible influencing more people.
8. Leaders defend village work against criticism and bring about a more favourable attitude toward the work.
9. Saves time of village worker.
10. Leaders speak in the language of local people.
11. Adds strength to village programme, placing part of responsibility for success on the village.

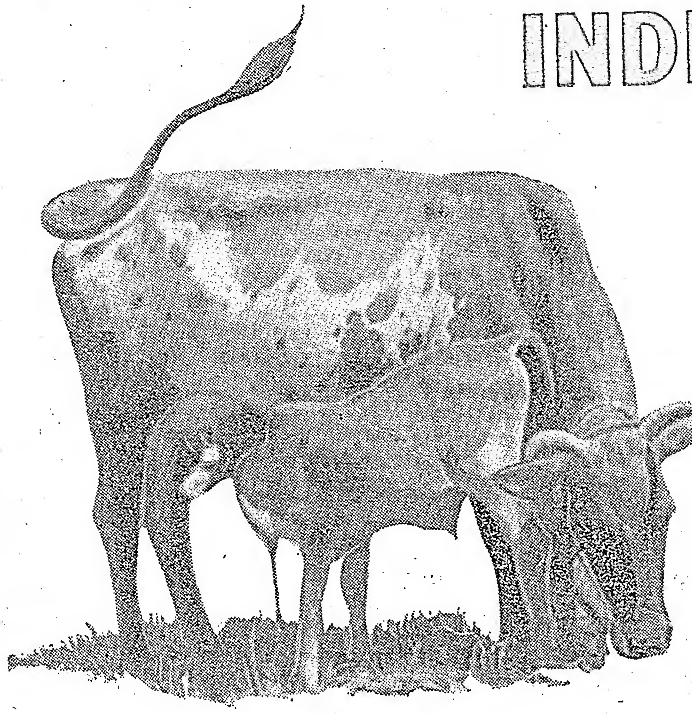
Limitations

1. Possible difficulties to overcome:
   (*a*) Local leaders may give wrong interpretation.
   (*b*) Local leaders may introduce own opinions.
   (*c*) Local leaders may not be good teachers.
   (*d*) Local leaders may not be able to spare amount of time required to receive adequate training.
   (*e*) Followers may object, wishing first-hand information from specialist.
2. Requires time to locate and train leaders.
3. Village worker's contacts may become limited, if he continues to train the same leaders.
4. Local leadership may be costly in proportion to results.
5. Local leaders may use prestige for personal gain.
6. The most difficult teaching job is left to local leaders who are not so well trained as agents and specialists.

(*Continued on page 32*)

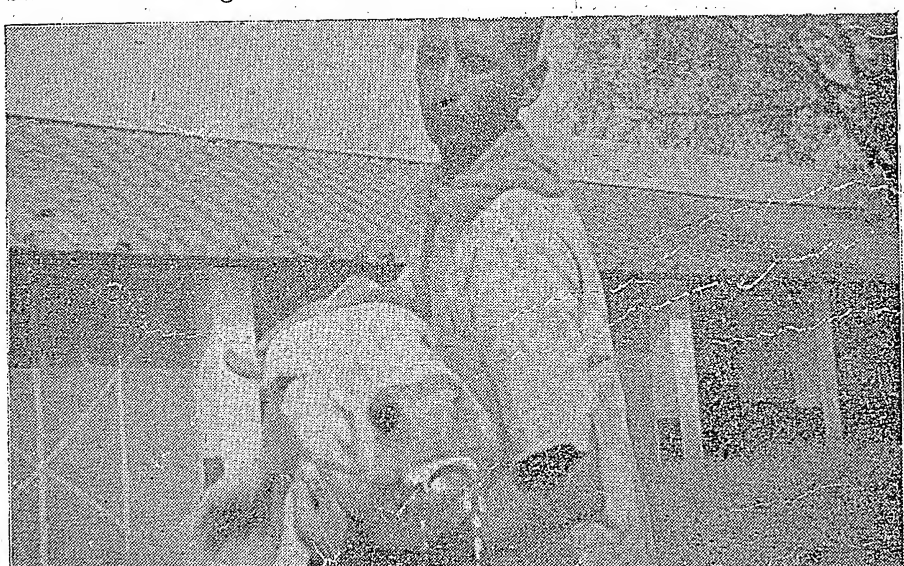
FOOT & MOUTH DISEASE IN INDIAN CATTLE

By **A. C. MATHUR**



FOOT and Mouth Disease which attacks 3.5 lakh animals and is responsible for the loss of about 2.5 crores of rupees annually is no doubt one of the most serious scourges of cattle in this country. Chiefly affecting cattle and buffaloes, sheep, goats and pigs are however not immune to its attacks. Human beings too are susceptible but to a lesser degree. Thus in a way it is important from public health point of view as well.

The disease being highly contagious spreads like wild fire affecting cattle throughout the length and breadth of the country. Attacks are usually endemic, appearing at frequent intervals the disease being present in certain localities throughout the year though in varying intensities.



An affected cow showing salivation from the mouth

ECONOMIC IMPORTANCE

As has been said above it affects 3.5 lakh cattle annually. There is a rapid loss in condition, milk yield of affected cows is markedly decreased which occasionally does not return to normal in the same or even in the subsequent lactations. Working animals are incapacitated and are not able to perform their normal work for varying periods. The irony of the situation is that the outbreaks mostly occur at the time of ploughing and sowing and thus cause great interference in the agricultural operations at a time when animals are needed most. 'Panting' is another serious complication which develops in quite a few animals and is characterized by difficult breeding particularly during summer. Other factors which contribute to economic losses are reduced breeding capacity, loss in flesh, deformed hoofs, etc. Actual mortality is low probably less than 1% in adult cattle. The death rate is however higher in young animals particularly if they are suckling the affected mother.

SYMPTOMS

The disease is caused by a 'virus', and is commonly recognized by the cattle owners by dribbling of long thread like saliva from the mouth and lameness of one or more legs. The diseased animal has indisposition to feed and split pea size blisters are found on the tongue, gums and mouth accompanied by smacking of lips. Blisters are also found between and above the claws resulting in shaking of legs. There is rapid loss in condition. When affected animals are properly looked after acute symptoms pass off in 3-5 days and recovery takes place in 10-15 days.

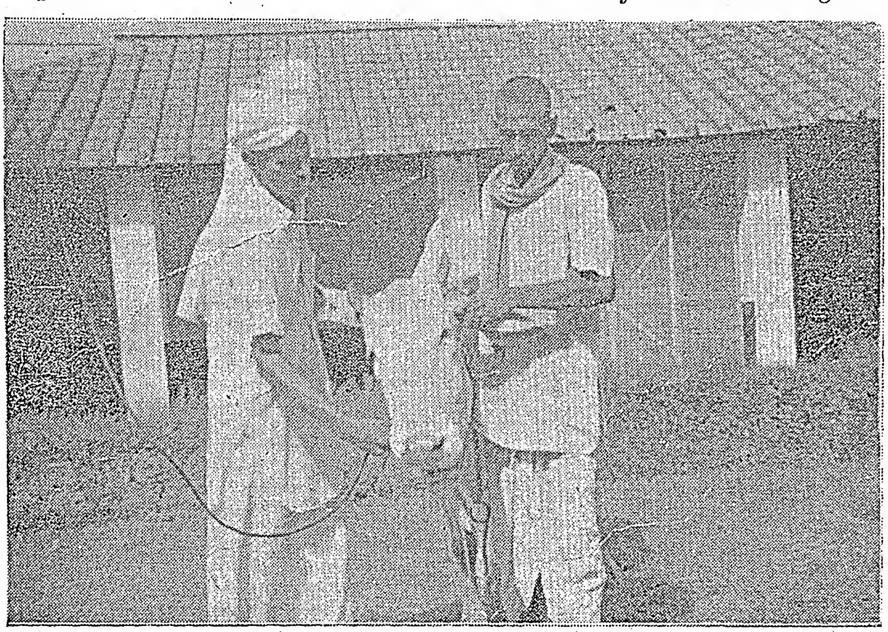
HOW IT SPREADS

The commonest agent to spread the disease from animal to animal is the infected animal itself. Saliva of the diseased animal which is highly contagious contaminates the pasture, roads, stables, halters,

feeding and watering troughs, straw, hay and railway wagons, and thus cause the disease to spread indirectly. Not infrequently the infective material from the teats of the affected cow gets mingled with the milk to infect suckling animals and human beings. Cattle attendants form an important source for transmitting the disease. Uncontrolled movement of cattle also transmits the disease across the borders of the State and from district to district. Sometimes dogs, vermins and birds convey the infection on their feet to distant places.

CONTROL AND TREATMENT

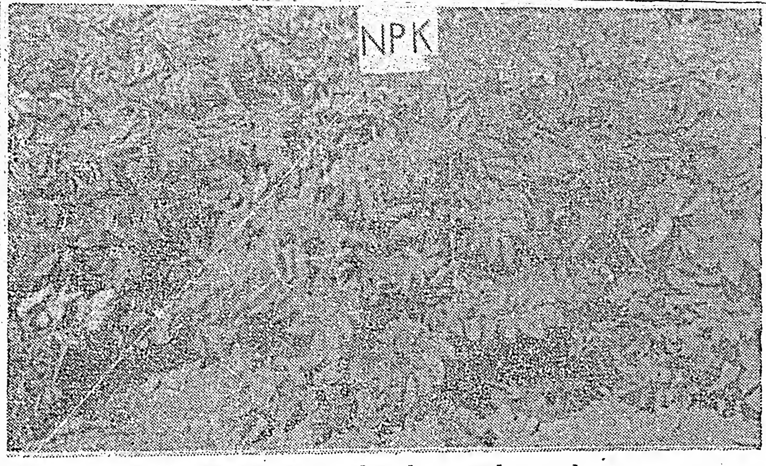
Considering the great economic importance of the disease the Indian



Treatment being given to an affected animal

Council of Agricultural Research in 1943 initiated organised research at the Indian Veterinary Research Institute on this disease to evolve a suitable protective vaccine. As a result of work done in this scheme an effective vaccine has been evolved by growing the virus on bovine tongue. However, the vaccine is yet too expensive to be introduced in the field for large scale vaccination. Further efforts are therefore being made to improve and make it cheaper. Unfortunately no specific drugs for the treatment of this disease are available.

Under natural conditions an outbreak lasts from 2-3 weeks. A useful practice to cut short the course of the disease occurring in large herds is to rub saliva from mild cases of the disease in the mouth of animals in close vicinity of the outbreak. Besides this, the lesions in the mouth and foot should be treated with proper antiseptics, like 1:1,000 potassium permanganate and 3% alum solution and those in the foot with a mixture of coal tar and copper sulphate—(Nila-thota). When large number of animals is affected in a village the foot lesions can be treated *en masse* by passing the animals through a foot bath which is filled with phenyle lotion. These measures help to a very great extent to effect a rapid cure. Therefore it is recommended that as soon as an outbreak occurs the nearest veterinary hospital should be informed so that the Veterinary Assistant Surgeon may visit the scene of outbreak and do the needful. The infected premises should be thoroughly cleaned and disinfected with 1-2% of caustic soda or 4% washing soda and as far as possible the contaminated material should be burnt. The virus causing the disease is easily killed by heat and so looses its activity in relatively short time particularly during the summer season, but under certain conditions such as dry atmosphere and low temperature it has considerable power of survival. Milk from affected animals should always be boiled before consumption. Adoption of these measures accompanied with public co-operation and understanding can help a lot to suppress the disease in this country.



Potato with nitrogen, phosphate and potash

Do you know your Soil?

By

S. P. RAYCHAUDHURI and **B. V. SUBBIAH,**

Indian Agricultural Research Institute, New Delhi.

THE problem of maintaining soil fertility and the need for improving the yields of crops is keenly felt by all farmers. They are always faced with the question as to what fertilizers are needed by their soils. Efficiency of fertilizer use would be increased by using it on the most responsive crops, on the most responsive soil devoted to that crop and on the particular soils which are at present receiving little or no fertilizer but have a tremendous yield potential. The primary purpose of soil testing service is to give the individual farmer dependable information on the nutrient status of each field under him.

WHAT IS SOIL TESTING

It is well known that all soils are not alike. Some are highly productive, some less productive and some others much less. Among the several factors that control crop production namely climate, physical conditions of the soil, crop variety, cultural practices, time of planting, weed control, insects, diseases, availability of plant food elements in adequate quantities is essential for full and maximum growth. The soil tests are designed to determine the limiting nutrients quickly and cheaply to meet the immediate need of the farmers.

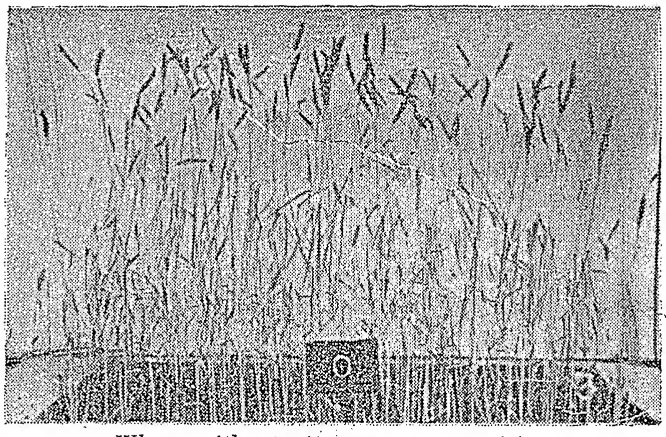
THE PRESENT NUTRIENT STATUS OF INDIAN SOILS

Soils in India have reached a low level of fertility due to continuous cropping and other unchecked factors like leaching and erosion. Application of adequate amounts of fertilizers combined with improved cultural practices only can build it up immediately.

The knowledge of the nutrient status of soil as shown by the chemical analysis is of great use but in India the data has been meagre to draw definite conclusions regarding crop responses and chemical analysis. Moreover the limits for judging the sufficiency or otherwise were not based on actual experiment. Most of the Indian soils come between fair or poor soils with respect to nitrogen and phosphate.

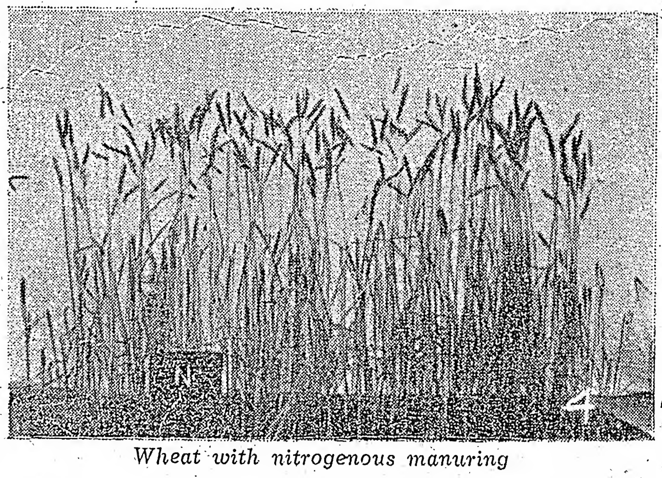
INORGANIC FERTILIZERS ON INDIAN SOILS

A review of some of the field experiments conducted at several places in India indicates that use of fertilizers may give extra yields varying from 20 to 70 per cent on the average for different crops. The following data indicate percentage increase due to the application of nitrogenous, phosphatic fertilizers and their combinations over crops grown in the absence of these fertilizers.



Wheat without nitrogenous manuring

Crops	Nitrogen	Phosphates	Nitrogen and phosphates
Paddy	23.2	20.4	50.0
Wheat	27.8	23.6	69.4
Sugarcane	47.4	30.3	46.6
Cotton	27.2	19.2	54.4
Oilseeds	49.4	19.0	44.0



Wheat with nitrogenous manuring

Although no systematic soil survey has been conducted in India to fix up the soil type for agronomic purposes, the distribution of broad classes are available. The responses to fertilizers on different soil types as obtained in the experiments conducted at different places are given below.

ALLUVIAL SOIL

Alluvial soils cover large areas in the Punjab, U. P., Bihar and Bengal as well as parts of Assam, and Orissa, and expansive deltaic areas of South India. Although the alluvial soils naturally are of high inherent productivity, their agricultural utilization has been complicated by the development of salinity in some areas.

Paddy in these areas has responded best with a combination of nitrogen and phosphate with an average response of 108 per cent over control. Nitrogen and phosphate alone were equal in their effect on the yield (21 to 23 per cent over control). Thus it is clear that both nitrogen and phosphate fertilizers are necessary for increasing the paddy yields in this area. With wheat irrigated also, a combination of nitrogen and phosphate gave the best increases over control—to the extent of about 61 per cent.

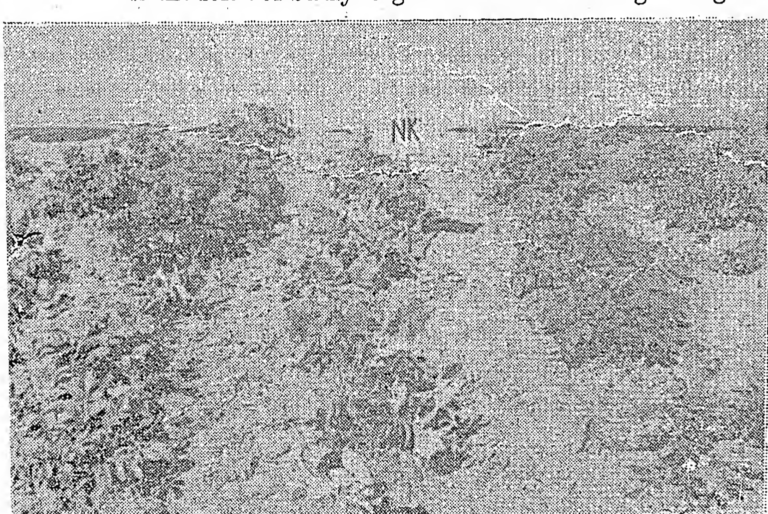
RED SOILS

Red soils occur extensively in many parts of India particularly in the northern and southern parts of the country and are generally neutral or acidic in reaction and relatively low in lime and phosphate.

In these soils although bulky organic manures and green manures appear to be superior to other treatments, a combination of nitrogen and phosphate has been found to be superior to either of them singly for wheat and paddy crops.

LATERITE SOILS

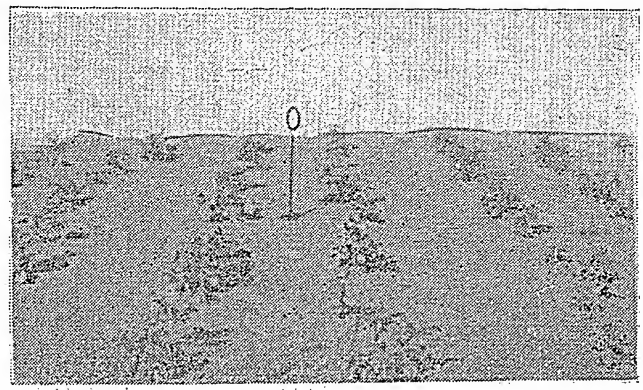
The soils occur in the Deccan, Mysore, Travancore, Central India, Madhya Pradesh the Eastern Ghats, regions of Orissa, South Bombay, Malabar and parts of Assam. Inherently these soils are of low fertility and tend to be deficient in common nutrients. Nitrogen in the form of bulky organic manures has given good response on paddy (50 to 60 per cent increase over control) and performed better than inorganic nitrogen, phosphate or both, showing thereby that there are deficiencies of other nutrients as well.



Potatoes with nitrogen and potash

BLACK SOILS

Black soils extend over a great part of the Bombay province, Kathiawar, Berar, the Western part of M. P., Central India, Hyderabad and some parts of the Madras Presidency. There are also mixed red and black soils in the south of Bombay, South East Madhya Pradesh, East Central Bihar, Southern U. P. Although these soils tend to be deficient in nitrogen and organic matter, the black soils are potentially rich and productive, provided adequate water is available for irrigation.



Potatoe without nitrogen, phosphate and potash

There are very few experiments on paddy and irrigated wheat in black soils. With irrigated wheat, a combination of inorganic nitrogen and phosphate gave the best increases in yields. On cotton also nitrogen combined with phosphate has proved superior to other treatments.

It must however be mentioned that any soil class may have a number of soil types showing different responses to manures and fertilizers and as such the conclusions drawn above are very general, having been based on the averages of soil classes of the different experimental stations in India. Moreover, they may have deficiency of other elements which can be only examined by rapid soil tests.

Thus, in India, all soils respond to nitrogen, and the present problem of manuring in India consists in finding out the phosphate deficiency of soils. Recent work in Indian Agricultural Research Institute shows the importance of phosphate in the build up of soil fertility. Proper applications of phosphatic fertilizers is an important aspect of increasing soil productivity by which the farmer is likely to derive both short term and long term benefits. It is in finding out this phosphate deficiency that farmers can themselves perform some simple tests.

The phosphate availability test is the simplest and requires very little equipment. This test makes use of the fact that a blue colour is developed when molybdate is added to a solution containing phosphate in the presence of a reducing agent, with intensity proportionate to the amount of phosphate in the solu-

tion. Several rapid tests are developed for determination of phosphate availability using this principle and differing only in the extracting agents. The interpretation of the colour developed is quite simple and the inference is made from the intensity of colour as follows :—(1) A dark blue indicates abundant supply (2) A high blue indicates adequate supply (3) A medium blue indicates a medium supply (4) A green or light green indicates moderately deficient supply (5) No colour or yellow colour indicates a very deficient supply.

ADVANTAGES OF SOIL TESTS OVER CONVENTIONAL METHODS

The advantages of these rapid soil testing systems are manifold. The procedures are relatively simple and the estimations rapid. It is possible to handle a large number of samples, about 500 to 1,000 a month by one trained worker. Conventional methods of chemical analysis are very costly and time consuming and for this type of advisory work no particular advantage is gained by their adoption.

PROCEDURE FOR COLLECTION OF SOIL SAMPLES

The value of a soil sample depends in large part on how closely the soil sample fits the purpose for which the sample is taken. The sample should be as representative of the area as possible and proper collection of soil samples is very important. Generally, composite samples are collected with the help of the spade and the auger from plough depth of 0-6 inches the maximum area per sample varying from 0.1 acre to 50 acres. A minimum number of 10 borings per sample is recommended. The soils are dried before sending them for soil testing. Trained personnel is required for collection of the samples and the staff of the agricultural extension service can assist the farmers in the proper collection of them.

NUTRIENTS EXAMINED AND THEIR INTERPRETATION

Although most of the tests are made for the deficiency of major nutrient elements, generally one or more of the following are determined depending on the type of the soil:—acidity, available phosphorus, potash, organic matter, calcium, magnesium, nitrate, nitrogen, ammoniacal nitrogen, boron, iron, manganese and soluble salts. The limits of availability for all Indian soils have still to be worked out.

Interpretation of these soil tests is done on the basis of the correlation obtained at the experimental stations of the local areas. There can be considerable variation from place to place in the amounts of plant food that can be classified as poor, medium, fair, good and very good depending on the soil, and the methods adopted.

SCOPE AND LIMITATIONS OF SOIL TESTS

The soil tests will aid in determining whether there is a deficiency of one or more of plant nutrients, and the need for soil amendments. They will also be useful in diagnosing certain plant deficiency diseases and in determining the toxic quantities of materials in the soil. They cannot, by their very nature, be helpful in determining whether a plant has died of root or another disease or due to root destroying pests. They cannot also determine physiological troubles arising from drought, temperature extremes, excess water, etc.

CONCLUDING REMARKS

Before adopting the rapid soil tests, they might be suitably modified and standardized against field tests. No single test can claim reliability for all crops and no single chemical criterion can indicate the supplying power of all soils for specific nutrient elements. The interpretation of the results of rapid chemical tests should be done only by an experienced individual knowing the nature of the soil under consideration and should have the results of a number of tests at his disposal. Nearly every soil lacks one or more of essential elements of plant food and this will be often the limiting factor for maximum crop production.

In our country it is also necessary to examine the methods most suitable to different tracts. There is a notion that testing kits will meet the needs but the tests made by these kits are purely of qualitative nature. Comprehensive tests can only be made in specially set up soil testing laboratories.

In a vast country like India, these methods if properly modified offer a rapid means of utilizing the limited available fertilizers and water resources for maximum production.

WHEAT AND BARLEY

(*Continued from page 11*)

ADOPT BETTER STANDARD OF FARMING

The cultivation of barley is very similar to that of wheat. It is sown about the same time as wheat, but matures earlier than the latter. As barley is a hardier crop, it requires less preparatory cultivation than wheat. The average yield of barley is generally low due to poor soil on which it is commonly grown. Though the water requirement of the barley crop is slightly less than that of wheat, the former is irrigated rarely. By manuring (10-30 lb. N per acre as ammonium sulphate) and irrigating, the yield of barley can exceed the best yield of wheat. To avoid loss due to shattering of earheads, the crop should be harvested before it becomes dead ripe.

PROTECT THE CROP AGAINST DISEASES

Heavy losses are caused to this crop by 'Loose smut' and 'Covered smut'. Like wheat, the control measures for 'Loose smut' are (*i*) solar or hot water treatment of the seed in May-June and (*ii*) rogueing of smutted plants in January-March. For the control of 'Covered smut' it is recommended to treat the seed before sowing by Agrosan GN or copper carbonate at 4 oz. per maund of seed. Further, the diseased plants should be rogued out in January-March and destroyed.

SEEK ADVICE FROM THE LOCAL AGRICULTURAL DEPARTMENT

In all matters relating to crop production, the local Agricultural Department should be freely consulted and their advice sought.

"GROW YOUR OWN FOOD'

(Contd. from page 13)

alround. The hours that would have been wasted were fully occupied and utilized. The feeling that something useful was being done gave an immense satisfaction and pleasure while working. The necessary tractors, bullocks and cultivation implements were taken from the Company on payment of necessary hire charges. The land was given free by the Company for cultivation.

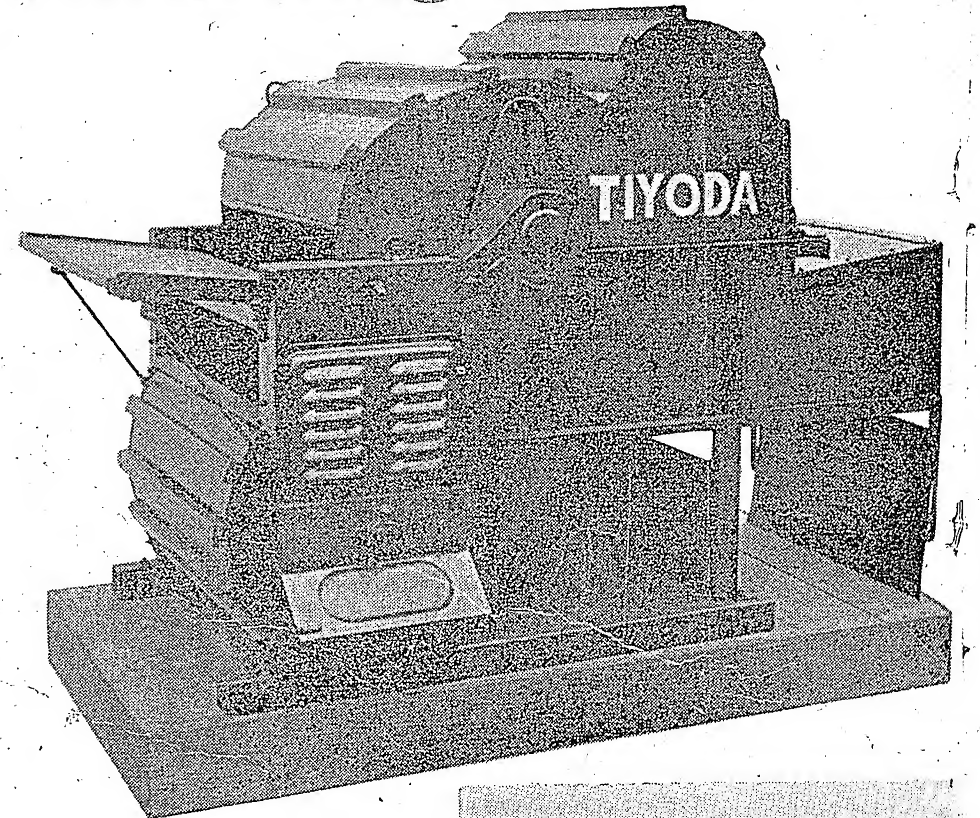
THE EFFORT & THE REWARD

After nearly five months of hard work, the crop was harvested in December, 1951. The members perhaps for the first time in their life enjoyed seeing the results of their own productive labour in the form of fields rich in corn. The total production of *bajri* was 326 bags and each member got roughly 2.75 bags of it, which are enough for an average family of four members for more than six months. Along with the grain, cattle fodder to the extent of 52 tons was produced, which was sold to the Company. The money so realized went to meet all the expenses incurred in raising the crop, such as for manure, irrigation, higher charges for tractors, bullocks, etc. The overall result was that for the spare time effort of the team for about five months, say for two hours every day and four to six hours on holidays, each member could get food enough for his family for six months.

The scheme was to continue during the *rabi* when 40 acres were to be put under wheat by the members and 20 acres under gram. Unfortunately, due to the unprecedented failure of the monsoon, the continuance of the scheme during *rabi* had to be dropped. If the cooperative team had taken the *rabi* crop of wheat and gram, there is no doubt that each member would have got enough food to meet the entire requirements of his family, if it consisted of only four persons, for the whole year.

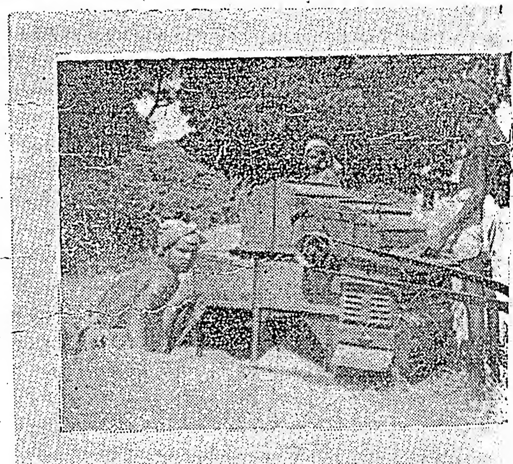
The unique experiment at Ravalgaon on cooperative farming and self help which proved such a great success shows that under suitable conditions and with proper organization and encouragement, an immense amount of productive effort could be harnessed. There is no doubt that there must be several places in India, where such organization of cooperative teams should be possible.

Useful Japanese Rice Threshing Machines



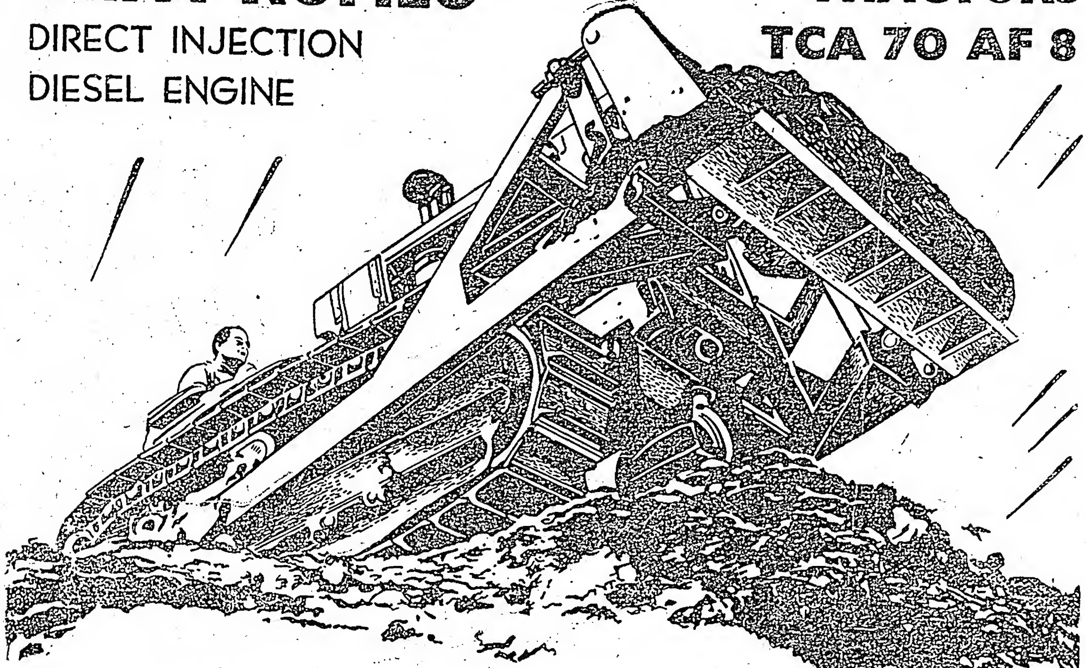
TIYODA TYPE POWER THRESHER

It is a power-operated threshing-cum-winnowing machine and can be worked with a 2-3 H.P. engine or an electric motor of 1-2 H.P. As in the case of pedal thresher it also has a cylinder or threshing drum of 23 inches width, fitted with hardened steel spring wire staples or tines. The threshing drum is fitted with a pulley and can be directly connected by means of a belt with the prime mover. For winnowing, there is a fan below the cylinder (separated by a screen) which is fitted with a pulley driven by a belt from the main cylinder pulley. An average speed of 500-600 R.P.M. of the drum is required for rice threshing. Two people can operate this machine. The dry sheaves are fed to the machine at one end; when they come against the drum the separated grains fall through the perforated concave and flow out through the outlet. The chaff and the broken straw are thrown out at the other end. This machine has been found to be very efficient, it removes the grain from the straw completely and there is no breakage of grains. It is simple in construction, very light and costs about Rs. 600. The turn-out is about 21-22 maunds of clean paddy per day as against 3-4 maunds obtained by hand beating. It is very useful for holdings of moderate size where electric power or an oil engine is available.



Machine in operation

—HARKIRAT SINGH

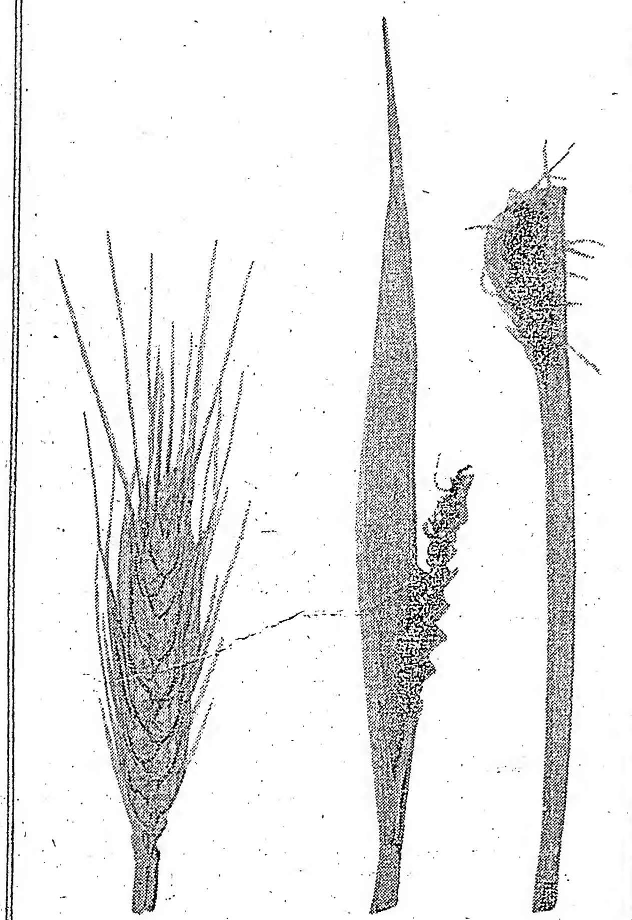


SUN AS A MEANS OF CONTROLLING WHEAT SMUT

By **R. S. VASUDEVA,** Division of Mycology and Plant Pathology, Indian Agricultural Research Institute, New Delhi.

Diseased crop raised from untreated seed — *SEED TREATMENT Soaking of seed and drying in sun* — *Healthy crop raised from treated seed*

INDIA is known to be the land of sunshine and bright weather. Both these gifts of Nature confer a boon on India by protecting health of man, animal and plant to a large extent. By the sterilizing effect of the sun some diseases are destroyed or kept in check. Recently experiments have been undertaken in some countries for utilization of the tremendous energy of the sun for industrial purposes. The use of the sun for controlling smut diseases was worked out by Luthra and has been successfully employed to eliminate infection of loose smut disease from wheat grain. The process is very simple and involves practically no cost. The farmer can use this without any difficulty, as there is no need of thermometer for regulating temperature of hot water as was the case in the old hot-water treatment. The smut disease is caused by a fungus which remains in dormant condition in the wheat grain. When grain germinates on sowing, the fungus becomes active and begins to grow with the plant. When the wheat plants come into ear the fungus manifests itself as a black powdery mass instead of normal grains. This powder consists of spores (seed) by which the fungus multiplies. The spores are blown about by wind and some of them on coming in contact with the flowers of the healthy wheat plants cause infection of the developing wheat grains. As the black smutted head produced by the infected wheat seed does not form any grain, there is a total loss of the produce of grain which is about 30-40 per head. The total loss of grain by this disease is of the value of several lakhs of rupees in North India and several other parts of the country. From recent reports it is obvious that nearly 10 per cent of the wheat crop this year has been affected by loose smut in about half a dozen important wheat growing districts of East Punjab. Actually the smut disease is prevalent wherever wheat is grown all over the world. By application of the sun such heavy losses of valuable foodgrain can be saved easily. The method has been in use in the Punjab for several years and it has been applied in Delhi and in Bombay also. Wherever the temperature of the sun is low, a little modification of the method can be made, e.g. after the grain is soaked in water for 4 hours it may be spread on cement surface which is hot enough to kill the fungus. In



Healthy ear *Diseased ears*

places where the temperature in the sun is 130° F. or more, the soaked grain can be dried on gunny bags. The method is to be used in two steps:

Soaking: Immerse wheat grain harvested from a field in which black heads have appeared in water at ordinary room temperature for 4 hours.

Drying: The seed thus soaked should be spread out for drying in the sun. In May and June, temperature of the sun in East Punjab, Uttar Pradesh, Madhya Pradesh and Bihar is strong enough to act on the fungus in the grain and kill it. The grain should be thoroughly dried and stored till required for sowing in the following October-November.

The same principle is being applied for the control of loose smut in barley and grain smut of *jowar* with encouraging results at the Indian Agricultural Research Institute, New Delhi.

They fill 2,000,000 Rice-bowls each year

By T. A. G. HUNGERFORD

Norman Simpson and his elder son, Ross, at work on the grading of a rice bay

WITH the harnessed waters of the Murrumbidgee River to help them, Australian rice-farmers Norman Simpson and his two sons, Ross and Barry, yearly produce hundreds of tons of rice and meat in a world that grows increasingly anxious over the source of its future meals.

September and October on the Australian rice farms of the Murrumbidgee Irrigation Area in southern New South Wales are months of fresh winds and blue skies, of heat that is a foretaste of the summer to come, and of sudden cold, dull days that drag the vanishing winter back for one more curtain-call.

It is the time of planting rice, and from early morning until sunset tinges the grassy tops of the dykes with a thin feather of gold, tractors cough and growl across the dry rice-bays as combines lodge the seeds of a new crop, writing their signature in geometric patterns in the shallow tilth.

Some years ago, I stood on a low dyke watching Japanese women plant rice in a flooded paddy only a few hundred yards from the seashore of Kurchachi Jima, a tiny island in the Inland Sea. To protect themselves from the driving rain and wind, they wore layered straw capes over their shoulders, but they stood to their knees in water, plunging their hands deep into the icy slush. As they moved across the paddy, slowly, methodically, little clumps of delicate green spears appeared in their wake, and the terraced hills of the mainland frowned down on them from a sleety sky.

Nobody knows how long that paddy has been producing its yearly crop, never rested, never replenished. Almost as soon as one crop is taken off, another is set. Almost before the gongs of thanksgiving for the harvest have stopped booming in the temples, prayers are being offered for another bountiful harvest. The land is tired.

It is thousands of miles and thousands of years away from the sun-warmed paddocks of Yenda, some 18 miles out of the town of Griffith, where Norm Simpson, veteran of the first World War, and his two sons, Ross

and Barry, yearly produce rice crops with an average of better than two tons (about 4480 lbs.) of rice to the acre.

The Murrumbidgee Irrigation Area has the highest yield of rice in the world.

Australia's contribution to the world's rice-bowl, although small at present, is destined for wide expansion as new areas all over the continent are brought into production. A survey of possibilities of large scale rice growing in the north of Western Australia, in the Northern Territory and in Queensland, has already been concluded, and several localities marked where soil and climatic conditions are suitable for rice growing, either by irrigation or by rainfall flooding.

MECHANIZATION OF RICE INDUSTRY

But whatever the consideration of growth, the seed must first be sown and last be harvested. Mechanization is the key to Australia's rice industry, from the water-wheel that measures the flow of water into the land to the complicated harvester that cuts, threshes, winnows and cleans the paddy-rice, and puts it into bags before it leaves the field.

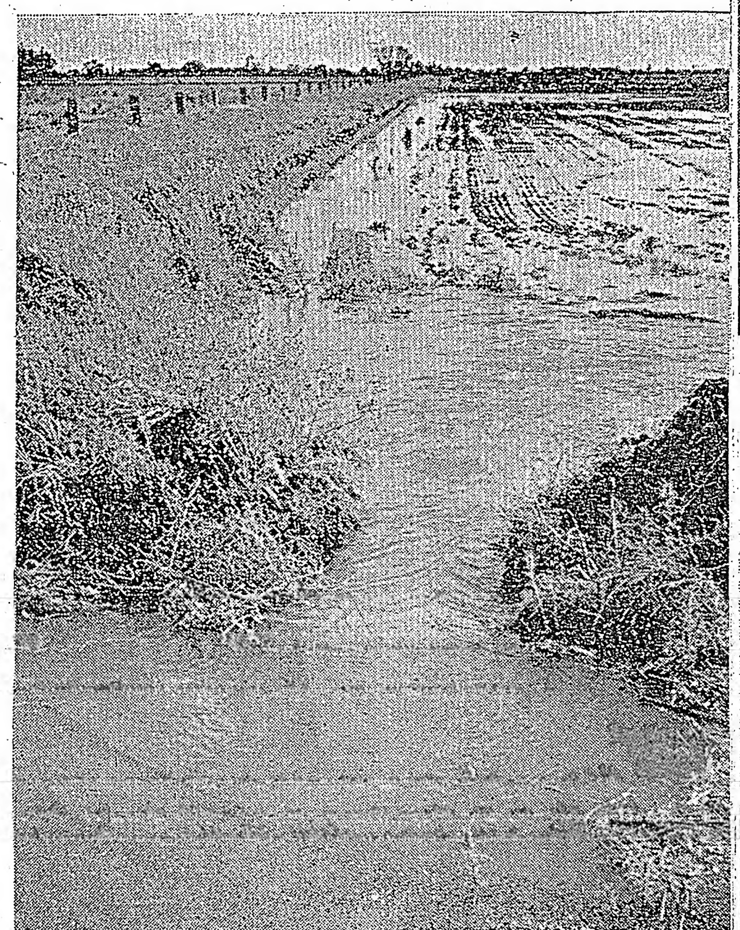
Norman Simpson takes fullest advantage of machinery on his block. In the winter, when he prepares his land, he sits on a tractor that draws the shining discs of a six furrow plough across the rice-bays, ploughing as deep or as shallow as he likes by the twist of a cog. When he sows in the spring, he uses a tractor and combine to sow at the rate of 25 to 30 acres a day on a dry surface, as with wheat. The sharp tines of the combine rip out the furrows, and the seed, regulated to whatever flow is deemed necessary, drops through funnels from the seed-box, about 116 lb. to the acre. The harrow, trailing behind, covers it up.

If during its resting period, the bay has been sown to a good cover of clover or lucerne, both of which fix nitrogen into the soil, there is no need for fertilizer. But if it has to be applied, sulphate of ammonia, at the rate of about two cwt. to the acre, runs from the manure box on the combine at the same time as the seed is sown; sometimes, it is broadcast in the flooded bays on the completion of sowing.

The surface of the bays is levelled by a grader, towed behind the tractor. Water which once was snow on the Australian Alps, and which has travelled perhaps a thousand miles down the Murrumbidgee River, flows gently from the main irrigation channels through a web of ditches and to the farthest corners of Norman Simpson's well-graded and surveyed rice bays.

To gather their crops, pioneer rice growers in Australia evolved a small engine which was used as

Sowing completed, the rice bay is flooded to a depth of about two inches to induce germination of the seed. Water is seen flowing into a partly-inundated bay from one of the large irrigation ditches that lattice the countryside around Yenda



Water flowing from an irrigation ditch into a partly flooded rice bay after the completion of sowing

Barry Simpson stops the tractor to refill the seed box of the combine

A wheel is used to measure the quantity of water used as it flows from the main canal into the ditch on the rice farm

auxiliary power on ordinary wheat-harvesters. Australian machinery firms using the same principle, built rice-headers, drawn by tractor or horses. With eight to twelve-foot cuts, they cut, thresh, winnow and clean the grain in one operation; they are fitted with grain boxes and bagging platforms so that the rice can be bagged while the headers are still moving through the crop.

Of recent years, the fore-cut automatic header has been increasingly used; while the side cut machine must destroy a portion of the crop by trampling the first cut around the edges of a bay, the fore-cut can enter a crop without damage in opening it up. Those of the growers in the irrigation area who have the older side-cut machine usually employ a contractor with a fore-cut auto-header to cut a track around their bays.

From sowing to harvesting, a retinue of machines wins the best possible results from the Australian rice-crops, and when finally the bagged grain is whisked by trailer-units to rail-head or local rice mill, another set takes over. These remove the grain from the husk, and the dust from the grain, polish it and deliver it as we know it best—white, pearly rice.

MAXIMUM RETURN ENSURED

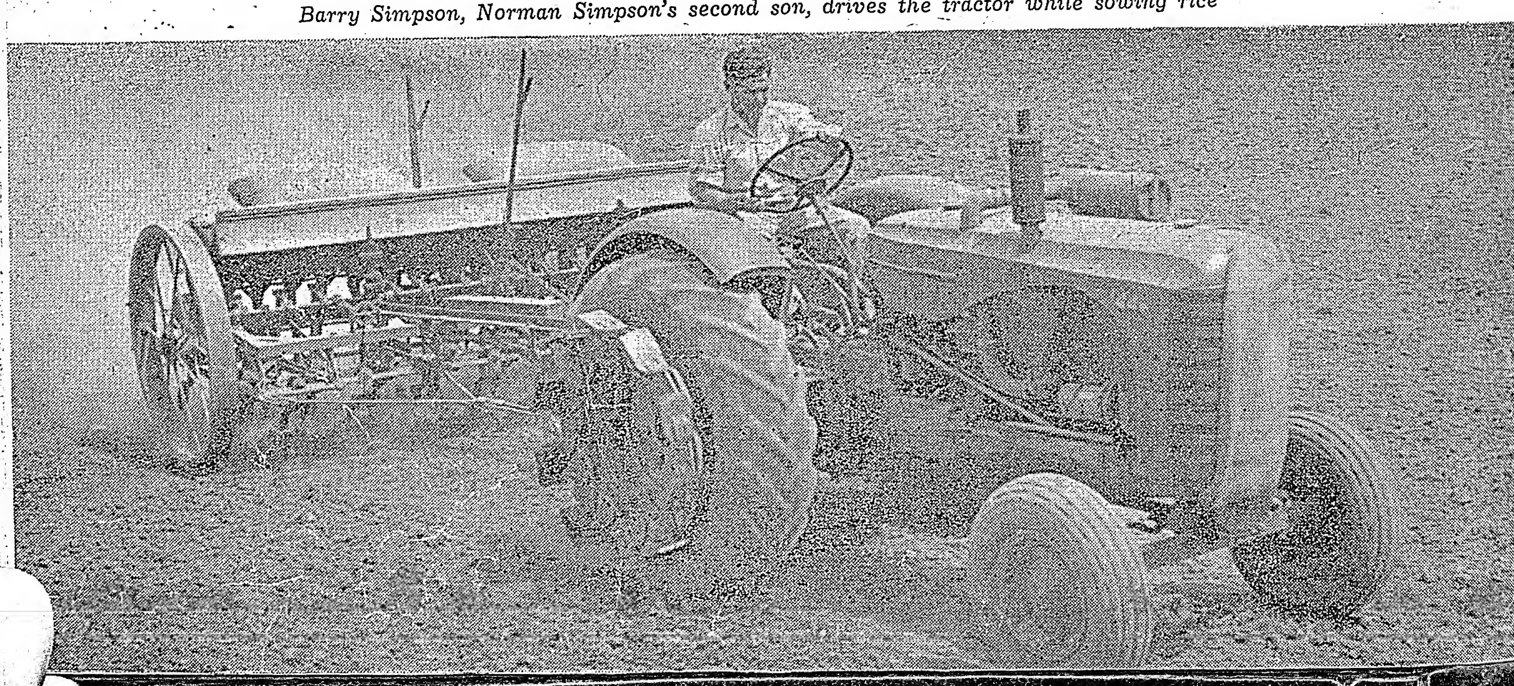
Through careful experimentation in Government departments, each tract of land is sown to the type of rice most suited to it, and through the most rigid quarantine supervision on the import of rice seed, no fungous diseases, which take such a heavy toll of crops overseas, have yet made their appearance in Australia. The farmer gets the maximum return for his work, and the men of the Murrumbidgee Irrigation Area own their land.

To get his crop in and to take it off, Norman Simpson uses an impressive array of Australian made farm machinery. He has two rubber-tyred 25/30 horse power tractors for hauling the machinery; a 5-furrow disc plough breaks up the hard country and a 12-disc Sundercut works the finer soils, with a 16-tyne scarifier and an offset disc cultivator that are substituted for the Sundercut in favourable conditions. To break down the first cultivation to a fine seed-bed, a disc harrows and a 6-leaf set of diamond harrows are used. There is a grader for levelling, a combine for sowing, and for harvesting, an engine-functioned, rubber-tyred grain header is used for wheat harvesting, but with an interchangeable modified threshing drum used for rice. For forming and repairing levee banks and ditches, there is a delver, and a single furrow road plough for use in conjunction with it.

Apart from the machinery used in the rice-farming on Jubarro, there is a pasture mower, and a fertilizer spreader which, attached to the general utility motor truck, is used in applying superphosphate to the pastures. For dipping the sheep against lice, there is a rotary spray dip, which is a vast improvement on the old-fashioned trough dip. And last but not least, there are six magnificent draught horses as a stand by—one year, when one rice bay yielded a fabulous 4 tons of rice to the acre, the mechanical header could not go through it. The horses, with men at their heads to slow them down, hauled the machine through the crop.

With this mechanical help and with the labour and experience of himself and his two sons, Norman Simpson produced 550 tons of the 75,000 tons of rice harvested last year from the 37,000 acres planted in the irrigation areas of the Murrumbidgee. The acreage and the yield does not alter very much from year to year on irrigated land; Asians normally eat about $1\frac{1}{2}$ lb. of rice a day in three meals, so that the work of these three Australian farmers fills over $2\frac{1}{2}$ million rice bowls every year.

Barry Simpson, Norman Simpson's second son, drives the tractor while sowing rice



ON THE FARM, TOO...

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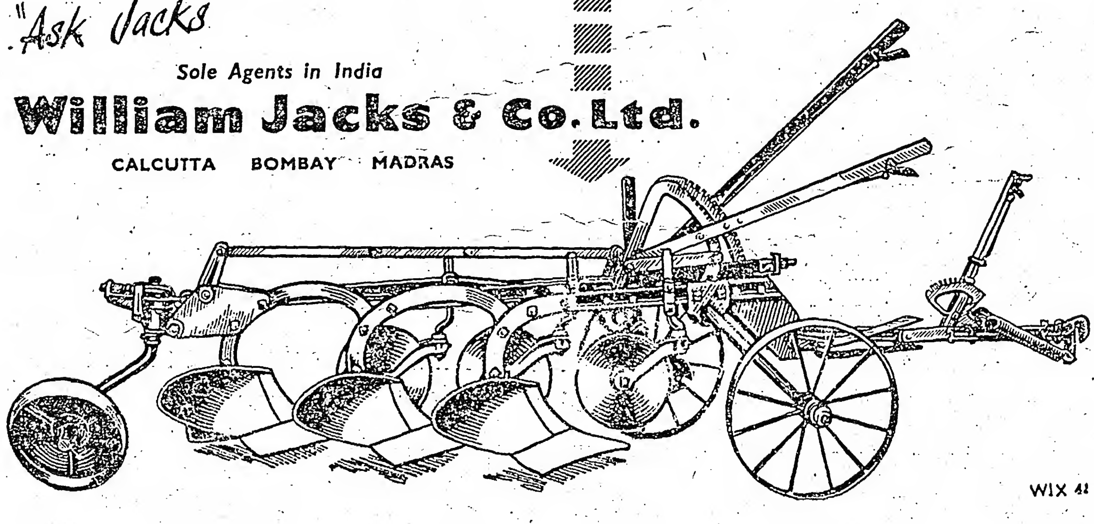
VILLAGE EXTENSION WORK

(*Continued from page 16*)

Some suggestions and guides when deciding to use local village leadership.

1. Determine the place of the local leader in the programme.
   - (*a*) Give careful consideration to the place of local leaders in a given project and outline their specific functions in it.
   - (*b*) Give careful consideration to the type of activities leaders are expected to perform.
   - (*c*) Give careful consideration to the type of subject-matter local leaders are capable of deporting.
   - (*d*) Use other means and agencies in proper relationship to local leader's demonstration work, preceding it to obtain attention and interest and following it to obtain action and satisfaction.
   - (*e*) Use sufficient number of leaders, and require small amount of time from each.
2. Select satisfactory leaders.
   - (*a*) Watch village people for evidence of new leadership and provide opportunity for its development and use.
   - (*b*) Have group select own leader after qualifications have been presented.
   - (*c*) Consider interests such as desire to help others, desire to help the group, and interest in the subject matter.
   - (*d*) Consider abilities such as educational background, and knowledge of the subject.
   - (*e*) Consider personality factors such as enthusiasm, tactfulness, loyalty, and standing in village.
3. Give leaders adequate training and assistance.
   - (*a*) Assist leaders in planning and organizing their work.
   - (*b*) Train leaders carefully in teaching methods, in knowledge of subject matter.
   - (*c*) Provide supplementary helps for use of leaders.
   - (*d*) Assist leaders in obtaining all necessary material for work.
   - (*e*) Encourage leaders to discuss leadership problems among themselves.
   - (*f*) Whenever possible, break up project handled by local leaders into short-time units.
   - (*g*) Provide material for leaders to use in obtaining reports from members of practices adopted.
4. Give leaders encouragement and recognition.
   - (*a*) Help leaders to develop strength through encouragement and supervision.
   - (*b*) Emphasize the possibilities of the project in the village and of the satisfaction of being a leader in it.
   - (*c*) Provide public recognition of work done by local leader at meetings and through the press.
   - (*d*) Rotate leaders from project to project and from year to year.
   - (*e*) Do not overwork willing leaders.

(*Concluded*)



Supplement to the September 1952 Issue of Indian Farming.

NEWS-LETTER OF THE ALL-INDIA WOMEN'S FOOD COUNCIL

Vol. II No. 6 ✳ **NEW DELHI** ✳ **SEPTEMBER 1952**

Grow your own vegetables. *Help yourself, Save food* *Annapoorna at your door.* *Non-cereal Cooking Demonstration.*

PUNJAB WOMEN'S FOOD COUNCIL'S WORK

EVERY evening hundreds of visitors flock to the non-cereal cafeteria of the Punjab Branch of the all-India Women's Food Council on the Ridgein Simla. The Cafeteria which was opened nearly a year ago has caught the popular fancy, thanks to the constant efforts of the members of the Women's Food Council led by their energetic Chairman, Shreemati Kusum Trivedi. The cafeteria is visited by more than a thousand persons every day and the place is equally popular with the highest and the lowest and thus has set up true democratic ideals in a conservative town like Simla. At midday one finds it full of the rickshaw pullers and others—who find the cafeteria an ideal place for their food and tea which they can get at rates within their reach. In the evening fashionable Simla Society out for a stroll on the Mall, finds the cafeteria a very convenient place to spend an enjoyable evening economically.

Constant personal supervision by the members of the Council ensures efficiency and maintenance of sanitary and hygienic conditions. The Chairman, Shreemati Kusum Trivedi, wife of the Governor of Punjab, Mrs. Nawab Singh, wife of the Chief Secretary to the Punjab Government, who is the Vice-Chairman of the Branch and Miss V. G. Bhan, Deputy Chairman of the Punjab Legislative Council and Secretary of the Punjab Branch of the All India Women's Food Council, along with the other members and office bearers of the committee and a band of social workers, personally supervise the work of the cafeteria and help at the counter by turns regularly.

In addition to paying off the money advanced by the Indian Red Cross for investment when the cafeteria was started, the Council has now saved some money out of the profits which have been invested in Government Securities. It is proposed to utilise the earnings for the construction of a model cafeteria at Chandigarh, the new Capital of the Punjab, whoun the Women's Food Council is trying to get a plabjeThe Committee has also sanctioned a grant of I 000/- per annum for the supply of nutritive fEN Gnd special medicines to patients in hospitals nnot afford to buy them.

Simila spur Br rias are functioning at Ludhiana and Ho icil has mpetition n the State and the Council hopes that it e to open such cafeterias in all the cities of jab.

Other activities of the Punjab Branch include encouragement of Kitchen gardening and saving of cereals at home. Apart from taking pledges from the people not to buy food in black market, the branch has also collected effective pledges from them for observing non-cereal day every week. The members get the ration cards of the signatories to the pledges endorsed from the rationing authorities to the effect that they can draw only six days' ration for the week on their cards. This ensures fulfilment of the pledges signed by the people.

ANNAPOORNA SERVICE FOR DELHI SCHOOLS

PENDING finalisation of the Delhi Municipality's plans for inexpensive and nutritious catering in the

institutions of Delhi, a scheme to serve nutritious non-cereal food for students during lunch has been put into operation by the Delhi Annapoorna of the All India Women's Food Council. The scheme was inaugurated at the Salwan Higher Secondary Schools for Boys and Girls on August, 4. The mobile Annapoorna visits the two schools to serve food to nearly 4000 students. Menus are being framed in consultation with the school authorities who have decided to take disciplinary action against those students who persist in buying food from the hawkers selling exposed indigenous things outside the school premises. In course of time Annapoorna authorities hope to cater other educational institutions as well.

In addition to saving cereals, this scheme will help set up a uniform standard of catering for students of the capital and in giving nutritious and clean food which will save them from the dangers of eating exposed food sold by the hawkers.

PREPARATIONS FOR ANNAPOORNA AT LUCKNOW

SHREEMATI LILAVATI MUNSHI, Vice-President of the All India Women's Food Council, has added vigour to the activities of the Council in Uttar Pradesh, despite her short stay in the State. Preparations are being made for opening Annapoorna in one of the most prominent localities of Lucknow and the cafeteria is expected to start functioning soon.

Mr. P. C. Rajpal, acting chief of the Annapoorna Organisation, is busy making designs and other preparations for the setting up of a model cafeteria.

ANNAPOORNA FOR NATIONAL ARCHIVES

NEW DELHI'S Annapoorna will soon have a branch at the National Archives of India. At the invitation of the Director General of Archives a plan has been made to open a branch and the room allotted for the cafeteria is being remodelled to suit the needs of a catering house. The food will be supplied by the New Delhi Annapoorna and only tea will be prepared on the spot.

A.I.W.F.C. CENTRAL COUNCIL MEETING

A MEETING of the Central Council of the All India Women's Food Council was held at Lucknow under the presidentship of Shreemati Lilavati Munshi on August 17, 1952. The Council considered various questions relating to the policies of the Council with regard to the working of the Annapoorna and allied matters in the light of the experience gained by it during the past two years.

Shri Rafi Ahmed Kidwai, Union Food Minister with Office Bearers.

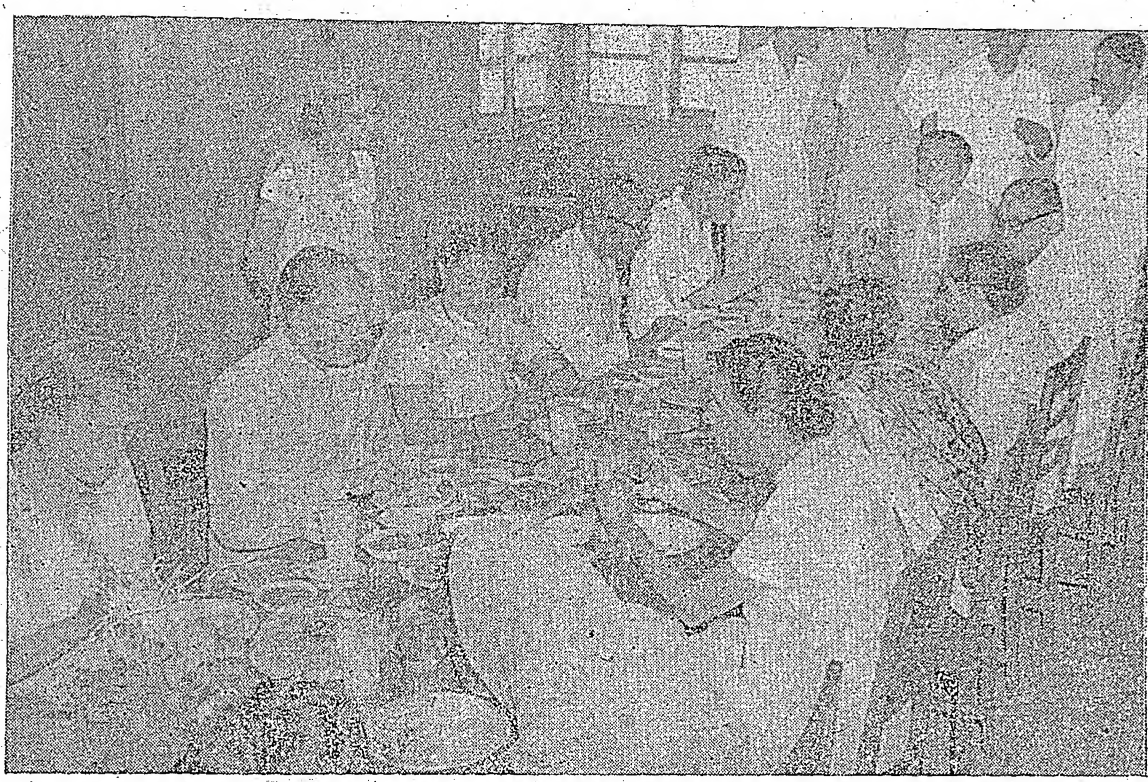
FOOD MINISTER VISITED ANNAPOORNA AT BOMBAY AND MADR[illegible]

SHRI RAFI AHMAD KIDWAI, Union Minister for Food and Agriculture, has shown keen interest in the activities of the All India Women's Food Council ever since he assumed office as a member of the Union Cabinet. He visited Annapoorna at Bombay and Madras. Towards May of this year Shri Kidwai was invited by the Bombay branch to visit the local cafeteria. The [illegible] was very much impressed and expressed [illegible]on for all the preparations made out of no[illegible] [illegible]gredients. He promised every help to [illegible]cil and was pleased to learn that a cou[illegible] [illegible]on and dietetics was being organised to [illegible] for the cafeterias. He also expressed the [illegible] Coun-

cil would be able to extend the service to other parts of the country in the near future.

The Minister visited the Madras Annapoorna on July 23, 1952. He was entertained to tea. After tea, Mrs. Mary Clubwala, Honorary Secretary of the Madras Branch of the All-India Women's Food Council said that the Women's Food Council in Madras was now running Annapoorna in two places permanently and a temporary cafetaria was set up at the Legislative Assembly Hall premises during the Assembly sessions. The cafetarias were patronised by nearly seven thousand persons every day.

Mr. Kidwai said that he was glad to see that the Women's Food Council was running the cafeterias so successfully. He said that Madras State required their help more than any other State because the people there were rice eaters. If they could teach the people of Madras to replace the rice diet with wheat which was more wholesome than rice, they would be doing a great service.



Dr. B. V. Keskar, Minister of State for Information and Broadcasting Visited "Annapoorna" while he was in the city recently.

NEED FOR AN ANNAPOORNA DOCUMENTARY

THE Managing Committee of the Bombay Branch of the All India Women's Food Council invited Dr. B. V. Keskar, Minister for Information and Broadcasting to lunch at Annapoorna in July. Shreemati Krishna Hutheesingh and Shreemati Kulsum Sayani, prominent social workers of Bombay were also present. The Minister and the other guests were taken round the cafeteria and the working details of the establishment were explained to them. The Honorary Secretary of the Branch Committee appealed to the Minister to help in giving publicity to the activities of the All India Women's Food Council by getting a documentary film made on the subject.

KITCHEN GARDEN COMPETITION

THE Bilaspur Branch of the All India Women's Food Council has decided to organise Kitchen Garden Competition as suggested by the Honorary Secretary of the Central Council in a circular recently sent to all the Branches of the AIWFC. The competitors have been divided into two classes and a small committee of the members of the Council has been formed to mark the competitors out for their respective categories.

BOMBAY ANNAPOORNA CELEBRATES ITS FIRST ANNIVERSARY

THE Annapoorna at Bombay celebrated its first anniversary on July 17. Lady Cowasjee Jehangir presided over the function. A message received from Shreemati Lilavati Munshi was read out by the Secretary. Lady Jehangir praised the work of the Council in relieving strain on rationed cereals and in helping the people to change their food habits

All the guests were entertained to tea and non-cereal food prepared at Annapoorna. The Vice-Chairman of the Branch, Shreemati Babiben Dayal, announced an award of five rupees to each of the members of the staff of the Annapoorna on the occasion.

ANNUAL CONFERENCE OF THE ALL INDIA WOMEN'S FOOD COUNCIL

SHREEMATI Lilavati Munshi proposes to call a conference of the Branches of the All India Women's Food Council sometime by the end of October this year and has requested the branches to write to her in advance regarding the problems they would like the conference to consider and discuss. Plans are also being made to organise the second course of nutrition and dietetics in October this year. The organizers will have the advantage of the presence of Miss Marjorie D. Erskine, an expert whose services have been made available to the Council by the Food and Agriculture Organization of the United Nations under the Expanded Technical Assistance Programme. Miss Erskine who has already arrived in India will help in organizing the course on right lines. She will now go round the existing cafeterias of the All India Women's Food Council to get an idea of the needs of this country before she takes charge of the course. The venue of the course has not yet been finally decided but it is likely to be conducted in Bombay. Shreemati Munshi has requested the branches to select their nominees for the course if they wish to send anyone for training. The terms and conditions for the trainees selected by the branches remain the same as they were last time. Those branches who want to take advantage of the course are requested to write to the head office immediately.

SUCCESS OF THE ANNAPOORNA IN WEST BENGAL

THE Annapoorna at Calcutta organized by the West Bengal Branch of the All India Women's Food Council has been extremely successful. The Council's Branch in Calcutta has paid off all the money advanced by the Central Tea Board for this cafeteria and the Board has now agreed to continue to help them in advisory capacity for a period of two months more.

Water shortage in the area was a problem for a branch in running the cafeteria successfully and the Council proposes to sink a tube well to solve it.

An idea of the appeal created by the Annapoorna and its usefulness can be had from the news that the Nutrition Advisory Council of the West Bengal Government has asked the Council to help in arranging the supply of cheap tiffin to the schools in Calcutta.

ADDRESS OF THE WEST BENGAL BRANCH OF THE AIWFC

THE office of the West Bengal Branch of the AIWFC has been changed from Raj Bhavan, Calcutta, to Girl Guide Office, Palace Court, 1, Kyd Street, Calcutta.

SALAD RECIPES PUBLISHED

WITH the growing interest in the nutritive value of vegetables, it has become necessary to frame suitable Salad Menus for the guidance of the people. The All India Women's Food Council has done a real service to the lovers of Salad by publishing a collection of forty-six salad recipes. Recipes vary from plain salads intended as side dishes for lunch and dinners to full meal salads. The pamphlet of the recipes is available from the head office of the All India Women's Food Council, Jamnagar House, Mansingh Road, New Delhi at a nominal price of four annas each.

ROORKEE STUDENTS TAKE TO RAW VEGETABLES

SHREEMATI Lilavati Munshi has received an interesting letter from Mrs. Hart, wife of the Vice-Chancellor of the Roorkee University. Mrs. Hart writes to say that she is very much impressed with the Salad Recipes just published by the All India Women's Food Council and believes that the book will be very useful for the eaters of raw vegetables. She and her family eat only raw vegetables for their mid-day meal. On the Campus, Mrs. Hart has written, some students followed their example and kept more fit than they did by taking usual cooked lunch. More than forty per cent. of students now eat raw vegetables for their mid-day meal regularly.

THEY LIKED ANNAPOORNA

(Extracts from the visitors' books maintained at Annapoornas will be published in this column).

AN effort in the right direction—one of the very good things to our credit since Independence.

PYARELALL.

Have had both lunch and tea at Annapoorna. The meals are very tasty and compare very well with restaurant meals in any part of the world. The cost is, I am told, very moderate indeed. The movement which is responsible for Annapoorna should have a great future in India and is fulfilling a most valuable purpose. Am very grateful for being entertained here.

L. E. CAMPBELL
F.A.O.

I greatly appreciate the food served in the Annapoorna. Not only that it is neatly served but it is quite tasteful and cheap and also healthy. I wonder why others are not taking to this business. The most surprising fact is that despite efficient service they are maintaining, they say that they are having a net profit. Only if the queues were not crowded, I would love to come here off and on, and take their tasteful tea.

MAHAVIR TYAGI
Minister of State (Finance).

AN APPEAL

Material for the next issue of the newsletter may kindly be sent to Mr. K. C. Agrawala, Honorary Propaganda Officer, All India Women's Food Council, Annapoorna, Queensway, New Delhi so as to reach him by the 25th September, 1952.

INDIAN FARMING

Vol. II. New Series No. 6. Sept. 1952

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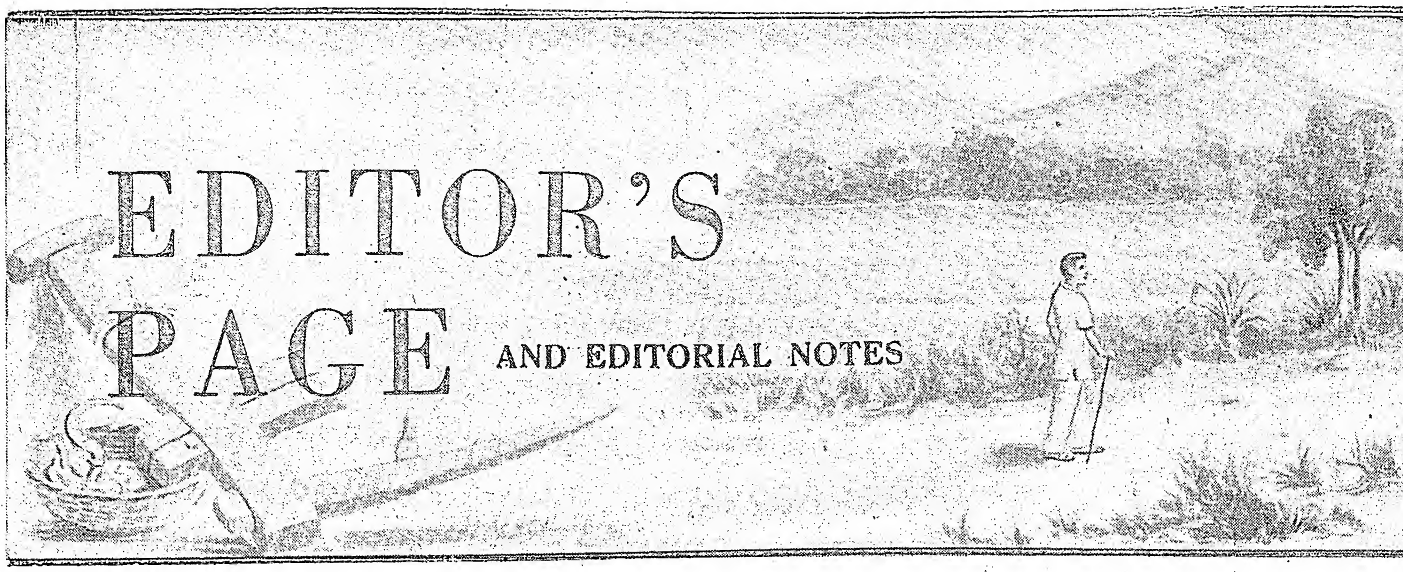
EDITOR'S PAGE AND EDITORIAL NOTES



Time and again we have been warned about the advance of the Rajasthan desert engulfing more and more fertile lands. The Ministry of Food and Agriculture has pointed out that it will have to throw a green belt to stop this encroachment right on the frontiers. At a time when India is striving strenuously to increase its food production and acreage under cultivation, it would indeed be a pity to find that more and more acres are being overrun by the desert sands.

This is, however, not a problem confined merely to India. Countries as far flung as India and the Chile, Australia and the Sahara are now actively engaged on research work in the arid regions, and research stations in these places are being strengthened. These stations will ensure that through exchange of information and maps, experience gained in one arid region will be applicable to others with similar conditions. Thus, a problem, which we might consider as our own, has world-wide implications and our interest is linked with the interest of the other countries where research work is being linked with the UNESCO research programme.

The *Courier*, a monthly publication of the UNESCO mentions that the United Nations through its expanded technical assistance programme is now making good progress toward reclaiming many of the world's arid areas and in protecting others from the encroachment of desert sands. We have already mentioned throwing of a green belt right across the frontiers to halt the marching sands. The emphasis on research this year will be concentrated on a plant species which may be transplanted to halt this march. Thus, while viewing the problem of saving the fertile lands from the onslaught of the Rajasthan desert our problem becomes that of halting the advance and then receding the tide by reclaiming more and more land. This problem is to be viewed in a wider perspective and all the help that we can get from the research work carried on by the UNESCO will be more than welcome. This research work is being carried out under the advisory committee of 9 scientists from Australia, Egypt, France, India, Israel, Mexico, Peru, the U.K., and the United States, and upon the success of the work of this committee depends the fate of vast fertile lands to save which will be the crucial question of the day in a few years.

LOCUSTS AGAIN

Drawing attention to announcement that yellow locust-swarms have crossed Pakistan border into Rajasthan we want to spot-light the interest of our readers once again on the locust problem. When last year one of the experts from United Kingdom frankly acclaimed the work done by the government locust organization, many sceptics shook their heads and considered this to be an extravagant statement. However, the speed and the imagination with which anti-locust campaign is conducted in the desert areas of Rajasthan deserves a mention again. Apart from using the conventional methods of combating locust menace, the Central Locust Control Organization is also using spraying fixed wing planes and power sprayers, dusters, radio sets, etc. for combining ground,

air, and other locust control operations. The Central Ministry of Food and Agriculture has already a fleet of 75 vehicles in action and the work done by the field staff reminds one of the field operations of an army in times of emergency. Although it is apprehended that the locust situation in the country will be serious during the next few months adequate steps are being taken to meet the menace and with Jaisalmer as the base for aerial control operations the anti-locust campaign will comprise of a reconnaisance survey and dusting and spraying with various insecticides in addition to the other normal anti-locust operations by the ground organization throughout the desert area. Combating locust invasion is the last ditch defence. Attempts are being made by various countries in locating the breeding grounds and destroying the eggs before a mischief is done. However with the wide world at its disposal it will be some time before a more efficient system is organized and in the meantime every precaution necessary will have to be taken to see that locust does not add to the worries of the country. The Locust Control and Plant Protection Organization of the Ministry of Food & Agriculture appears to be fully alive to this fact and the way in which it tackles the problems is, to say the least, very refreshing.

RESEARCH IN COTTON

The work of improvement of cotton crop in the State is being carried. Efforts are being made to evolve suitable medium staple cottons for the Hariana tract. One variety, numbered as 216F and christened *Harianana kapas*, has already been isolated from American varieties and given out to the cultivators. This variety is early in maturity, highly resistant to drought, and spins 30 counts with the mean fibre length of 0·92 inches. In yielding capacity it is as good as, if not slightly better than, the best local varieties. In fact 216F vacates the fields so early as to be followed by a *rabi* crop. This variety is finding favour with the cultivators and spreading very rapidly. The multiplication and distribution of the seed of Hariana *kapas* has also been undertaken. Attempts are also being made to evolve suitable medium staple cottons for cultivation in the central districts. Experiments carried out so far indicate that a selection from L. S. S. cotton, numbered as 320F, meets the requirements of these districts best.

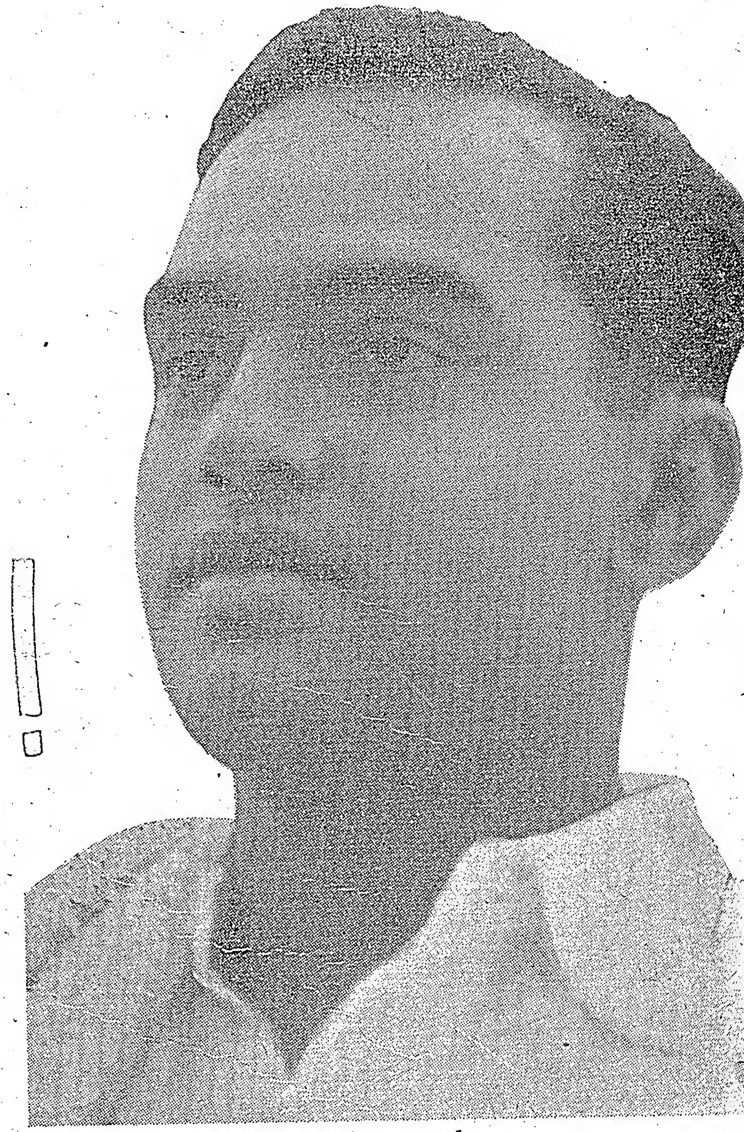
The work of supplying seeds of improved cotton to the cultivators has been undertaken as also rendering help to them by way of improving water supply, arranging for fertilizers, controlling of pests and diseases etc.

A CORRECTION

"August, 1952 issue of Indian Farming, page 18, Line 20 from above *for* breeding *read* breathing".

THE MAN OF THE MONTH

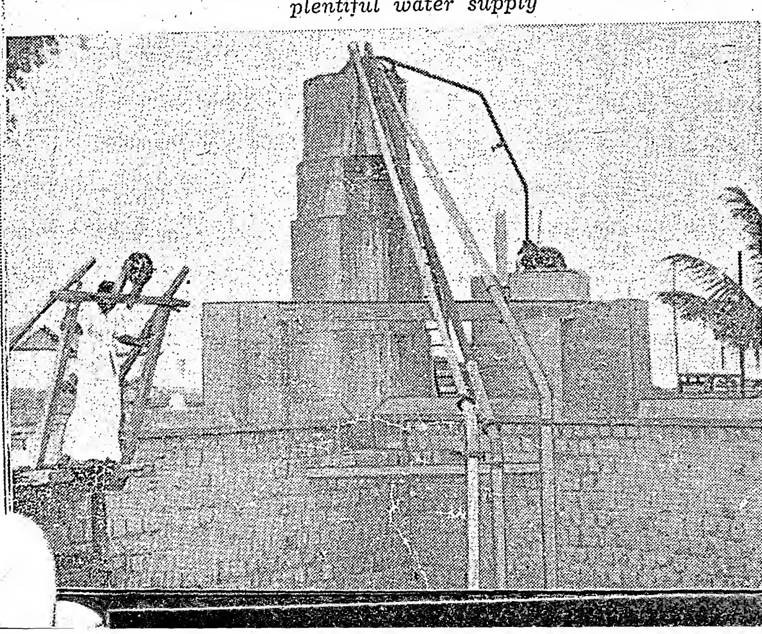
With him Farming is an Industry!



A farmer by aptitude

WHEN Shri K. Shivasankaran Menon, District Agricultural Officer of Coimbatore suggested that the P. S. G. Rangaswamy Naidu & Sons' Estate in Vedapatti was worth a visit, I was prepared merely for a boring two hours' visit to a hobby horse of a rich industrialist. This also out of respect for Mr. Menon who had done so much in showing me round Coimbatore and its farms. I expected this to be one of those sprawling estates where a farm house is kept for week-end picnics and provides for sinking of surplus capital. For sure, I didn't hope to find a well-organized systematically run farm with a first class system of irrigation through siphon wells and underground pipes. Nor could anyone have dreamt of seeing a neatly parcelled out farm growing a variety of crops.

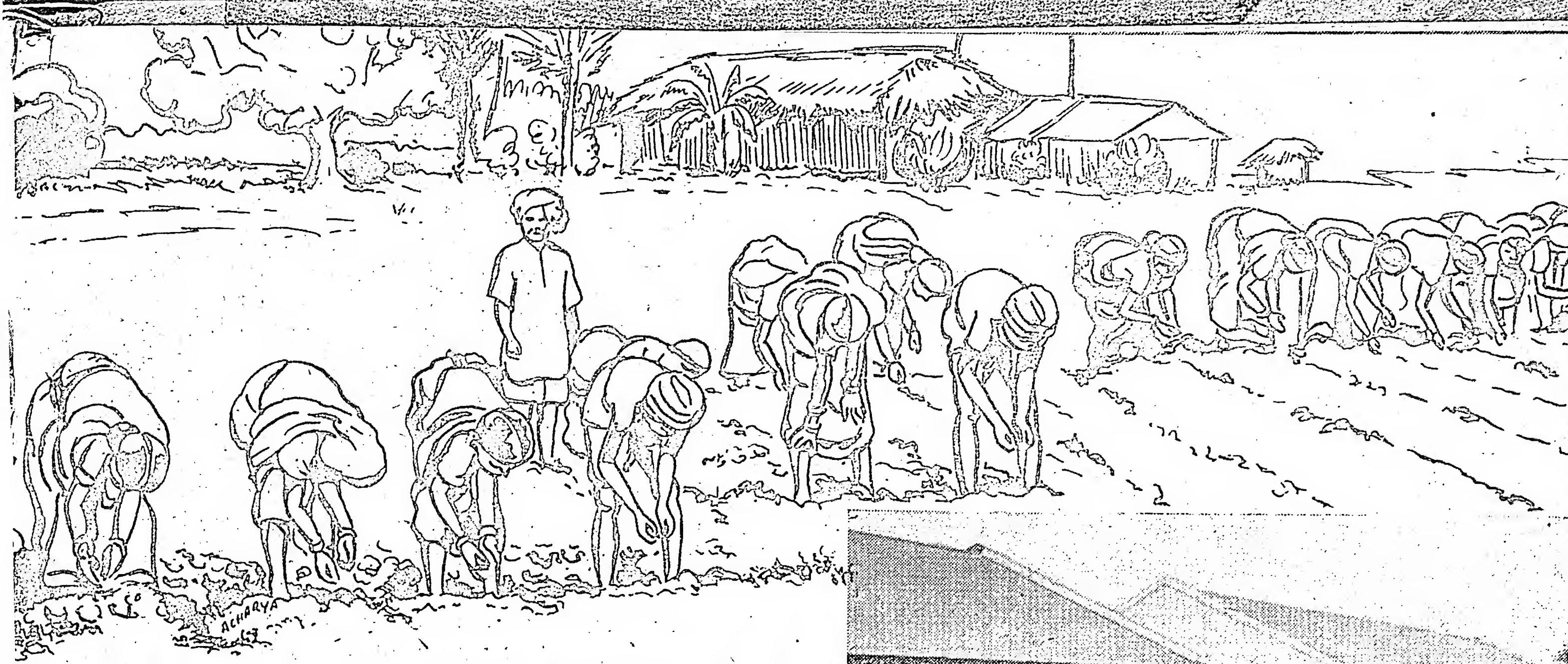
Five such siphon wells help Naidu keep his fields with plentiful water supply



The estate is situated in the village of Vedapatti, on the outskirts of Coimbatore very near the estate of the Government Agricultural College. It consists of compact blocks of land irrigated by flow of channel waters and garden lands irrigated by lift from the wells by centrifugal pumps.

INDUSTRIOUS FARMING

G. R. Govindraju Naidu, the man behind this highly organized farm took us round. Born with a silver spoon in his mouth, this young man in early thirties takes as keen interest in the farm operations as in the family industrial and the charitable concerns. He is proud of this estate which has modern and up-to-date machinery. All the machines are freely and fully used in the agricultural operations. The tractors, ploughs of different kinds, bund formers, levellers, chaff cutters, seed drills, harvesting machines, thrashing machines, etc. are some of the common machines and



implements. Thus by the use of these accessories a good deal of labour which would otherwise have to be employed is saved and the farm is run most economically.

COMPOSTING—A FEATURE

When asked what were the special features of his farm, Naidu said that firstly it is run as an industry. Secondly, the collection of manure required for the fields at various stages is another special feature of farming. The scavenging gleanings of the Coimbatore Municipality, cattle dungs, and all waste matters are collected in huge specially dug pits which are mixed together and allowed to putrify. By the time they are taken for use as manure, they become very good manure. Green manures, ammonium sulphate, super phosphate, groundnut cakes, etc. are freely used at the proper stages of agricultural operation. However, extreme care is taken to ensure that expenses are not out of proportion to the income. As a matter of interest the only advantage they have is that of having finances to effect improvements leading to improved farming and possibility of adequate returns on capital investment.

IMPROVED TECHNIQUES—AN ATTRACTION

Naidu told me that his modern method of agriculture has attracted many officers of the agriculture department either of that locality or those who happened to visit Coimbatore. Many consider it a pleasure to study the methods of agriculture followed here and he himself profits a lot by the advice and suggestions given by experts as to the management of the farm which would iultmately turn it into an ideal estate.

While feeling justifiably proud of what is being done, Mr. Naidu was all praise for the local agriculture department, whose interest in the farm and help its officers were prepared to give, have contributed to the success of this experiment. It was noteworthy that he could combat various diseases and pests assuring a fair and healthy growth of the crop, thanks to the plant protection service of the State.

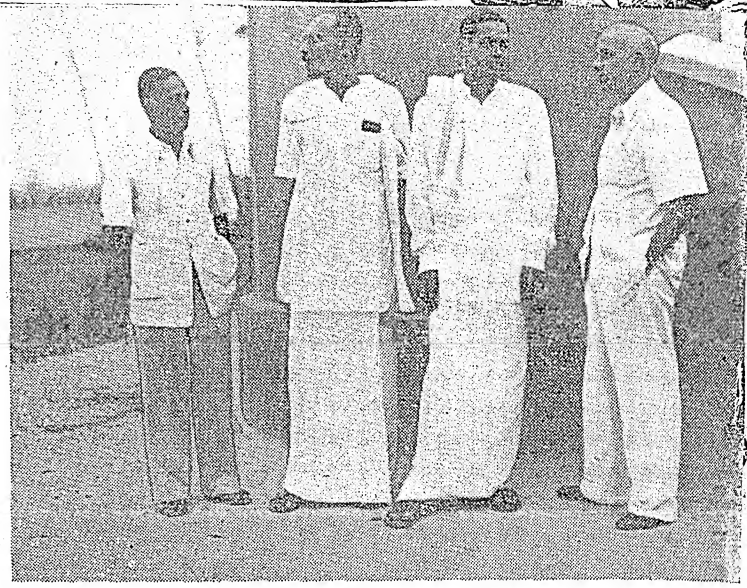
WORKERS WELL PROVIDED FOR

As a progressive industrialist farmer Naidu understands the desirability of encouraging progress all

In the picture are seen a few of the buffaloes maintained by Naidu

One of the many loyal and energetic workers who help Naidu to raise bumper crops

Agricultural authorities are seen here inspecting Naidu's farm



Naidu discusses common problems with State Agricultural authorities

round, and has considered it his primary duty to provide basic education and adult schools for labourers working in the fields. The Naidu family is well known in Coimbatore and runs an Arts college, an engineering college, a polytechnic school, a high school, two elementary schools, and hospitals. They have not forgotten their agricultural workers and a basic education school is being conducted at Vedapatti and is recognized by the educational department of the Government of Madras. The children mostly of the labourers working in the farm and of those living in the surrounding villages are freely admitted and are given free education using the latest basic education methods. In addition, for the benefit of illiterate workers who toil all day long in the field for their livelihood, Naidu has a night school where they are admitted during night time or at their leisure. They are given the necessary instructions and training in reading and writing and are encouraged to discuss current topics of the day so that they are kept well-up for the times.

The health problems also are not forgotten and a rural dispensary is being run where a qualified doctor and a compounder administer to the needs of the locality.

Malaria was very common when the estate was started in 1945, but by 1951 complete eradication was reported.

Being an industrialist Naidu realizes that if he is to run his farm as an industry he must keep his workers contented and he set about it in right earnest by providing free quarters for the staff and labourers and by giving other amenities to the permanent labour force which numbers 50.

IT IS A GOOD SIZE FARM

On a farm of 285 acres, 22 acres are irrigated by the Chitrachavadi Channel for about a year and the rest of the area of about 263 acres of garden lands are provided for by 5 siphon wells. Water is being pumped from the wells with electric motors and is stored in high level cisterns. These are connected by under ground tubes in such a way that the water can be sent out wherever necessary.

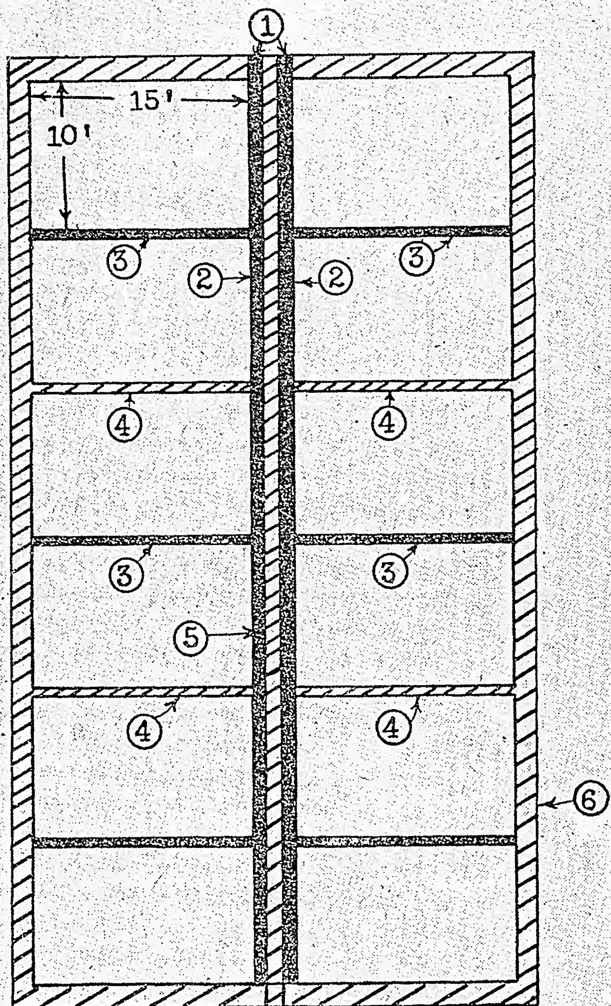
Naidu would like to go in for intensive cultivation. He finds that the failure of monsoon resulting in the insufficiency of water in the river as well as in the wells and the insufficient supply of electric energy for driving the pumping sets are the serious handicaps. If these, together with proper and good quality of manures are assured, with the proper handling of labour problem, it would be possible to run the farm as an ideal one and increase the productivity of the soil several times more.

Even for a well-managed farm, the work animals and other cattle as well as implements made available to the farm manager make impressive reading. This estate has at its disposal some 20 pairs of work bullocks and a number of buffaloes, cows, stud-buffaloes, etc. It also has a number of tractors, iron ploughs, bund-formers, chaff cutters, seed drills, and a variety of ploughs. Naidu who takes two crops of paddy each year has in addition sugarcane, Cholam, Ragi, Cumbu, cotton, growing on his estate. His figures of yield make interesting reading in that his average is very much higher than the average in the district or even in the State. But the reason why Naidu is featured as a Man of the Month does not lie in the increased yield he is getting on his farm. He belongs to an industrialist family, a family which till 1945 had never thought of taking to land. But having once taken to farming he has to make an outstanding success of it. He is well on his way to success because he is one of the few industrialists, who run a mechanized farm on the same lines as an industry. It cannot be denied that farming as done by Naidu should be a pleasure because he does not have the initial headache of finding finances. However, this is not enough. What is required in making a success of any job is personal interest and that Naidu has in abundance.

—PUSHKAR U. OZA


Labouring hands get dirty . . .
and where there's dirt there's Danger from germs!
LIFEBUOY SOAP
Wash often with
LIFEBUOY SOAP
it protects you from the germs in dirt!
L. 114-193

LAYOUT OF KITCHEN GARDEN



1. Source of water supply
2. Main water channels $1\frac{1}{2}$'
3. Sub water channels 1'
4. Path 1'
5. Main path 2'
6. Border path $2\frac{1}{2}$'

ONE major reason for the poor health of our nation, especially the poorer classes, is unbalanced diet. Notwithstanding the primary position that cereals must occupy in our food the value of adequate quantities of vegetables in our daily menu cannot be overemphasized. Apart from supplying the main food nutrients like carbohydrates, proteins and fats in easily digestible and most palatable form, vegetables happen to be a rich and important source of vitamins and minerals so essential for good health. Consumption of vegetables must, therefore, be encouraged among our people, if the health of the nation is to be improved.

To achieve this objective, cultivation of vegetables should be encouraged, because at present, due to insufficient production and consequent high prices, vegetables have almost become a luxury which few people can afford.

There are two ways in which this problem can be

Hints to the farmer :

Rabi Vegetables

By **R. D. VERMA**, Division of Agronomy,
Indian Agricultural Research Institute, New Delhi

tackled: (*i*) increased production by large scale vegetable growers and (*ii*) encouragement and guidance to those who have the interest and some land, to grow as much of their own supplies of fresh vegetables, as possible. This article, therefore, aims at giving some useful hints to the vegetable grower to enable him to raise better crops as also guiding the layman to maintain a healthy and profitable kitchen garden.

The following principal Rabi vegetables have been discussed :

(1) *Root crops* : Potato, Carrot, Turnip, Radish, Beetroot, Onion.

(2) *Fruit bearing crops* : Peas, French beans, Broad beans, Brinjals.

(3) *Cauliflower and Cabbage family crops* : Cauliflower, Cabbage, Knol-Khol, Brusell sprout, Broccoli.

(4) *Salad and leafy vegetables* : Spinach, Fenugreek, Lettuce.

(5) *Aromatic and flavouring crops*: Chillies, Coriander.

Although in a short article like this, it is impossible to do full justice to the subject yet, it is felt, that if the various points set down herein are kept in mind, major pitfalls which lead to failure and consequent discouragement, can successfully be avoided.

LOCATION AND LAYOUT

The vegetable area should be so situated as to get maximum sunlight. A south-easterly location, free of shady trees is most suitable. If it is not possible to avoid trees altogether, their branches should be trimmed to reduce the shading effect ; if, on the other hand, the land is too exposed to strong winds, it will be desirable to plant a hedge on the windward side as a screen and protection. But the hedge should be kept well trimmed and all weeds growing underneath it should be removed regularly.

Drainage must also be taken care of. If the land is not naturally well drained artificial drains should be provided. On no account should water be allowed to stagnate in the vegetable plots.

The layout should be such that all parts of the field can easily and properly be irrigated and are conveniently accessible for other work without having to go through the plots. It is advisable to divide the land into convenient square or rectangular plots of uniform size.

"Sioux"—an improved variety of tomato. Heavy cropper of beautifully round shape large sized fruits of excellent flavour

Brinjal—A plant of "Pusa Purple" showing heavy bearing

Regular paths and irrigation channels should be provided. After the land has been marked into plots and paths and the channels have been made, the plots should be thoroughly levelled.

MANURING

As the land under vegetables is normally very intensively cropped, heavy manuring is necessary to keep the land in a high state of fertility. A minimum of 20-25 cartloads of farmyard manure per acre is essential. It should be applied 6-8 weeks before vegetables are sown and should be ploughed or dug in immediately. If a sufficient quantity of farmyard manure is not available compost or sludge may be substituted for a part of it. Compost can be easily prepared from the garden and kitchen refuse such as waste potatoes, beans, pea, haulms, tops of rootcrops, waste cabbage leaves, surplus plants, weeds, leaves and other lawn mowings. Material to be composted is built up in layers to a height of 4–5 ft. in a rectangular pit 2–2½ ft. deep, with a thin layer of dung earth or good dusting with nitrogenous manures between each 9 in.–1 ft. layer of material. The material should be turned once or twice during the decomposition period. These organic manures are valuable in two ways: (*i*) they act as steady source of supply of all the nutrients normally required by the plant and (*ii*) the organic matter in them is essential for (*a*) all biological activity in the soil, without which soil fertility can neither be built up nor maintained, (*b*) for absorbing and retaining moisture in the soil, (*c*) for improving soil structure, (*d*) for absorbing greater heat from the sun, and (*e*) for the supply of micro nutrients.

Farmyard manure is undoubtedly the best manure for vegetables, but as different vegetables have different manurial requirements the use of fertilizers becomes necessary to meet these special needs. Generally speaking, leafy vegetables benefit more by the application of nitrogenous fertilizers such as ammonium sulphate, root and fruit bearing crops by the application of phosphatic such as superphosphate and bonemeal and potassic fertilizers of which common one in use is sulphate of potash. It may, however, be mentioned that Indian soils are rich in potash and application of potassic fertilizer is very rarely necessary. Nitrogenous fertilizers should be used very carefully and sparingly. Overdozing may lead to soft, unhealthy vegetative growth. They should never come in contact with leaf surface, otherwise, scorching of leaves may take place and the plants may even perish. Irrigation should be applied as soon as possible after application of these fertilizers.

SELECTION OF SEED

The seeds should be sound, free of weed-seeds, of good germination and true to the type. Inferior quality seed will invariably give a poor crop. It is, therefore, always better to purchase seeds from a seed firm of high repute. Such firms have their seeds tested for germination and usually have a large choice of improved varieties to offer. An improved variety will give a better crop at no extra cost except a little higher cost of seeds. When raising your own seeds select healthy and true to the type plants for the purpose. But seed production is a highly specialized job. It is usually better to buy your seed requirements from some good seed grower.

SOWING AND TRANSPLANTING

Sowing of Rabi vegetables begins with the end of monsoon and approach of the winter season. Most vegetable seeds are usually available in three strains—early, main and late. Each type should be sown at the proper time to get best results. As early sowings are done under adverse weather conditions, extra care is necessary in nursery raising. Following precautions will help in raising healthy plants in the nursery:

(*i*) *A fine seed bed is essential*:—A well shifted mixture of four parts each of sandy soil, and leaf mould and one part of well rotten animal manure is suitable for nursery sowing. If sowing is being done on the ground small nursery beds raised a few inches above the ground level should be provided to ensure good drainage. Before sowing, the nursery beds or pots should be thoroughly watered so that the soil may settle down properly. After 2-3 days top 1-2 in. of soil is prepared and sowing done.

(*ii*) *Avoid thick sowing*: It is wasteful of valuable seeds. Moreover, fungus diseases like "Damping off" readily attack the seedlings if there is overcrowding in the nursery. Over irrigation should also be avoided

(*Continued on page 18*)

MARKET NEWS SERVICE FOR FARMERS

Mr. R. T. Mirchandani (left) of the Directorate of Marketing & Inspection, New Delhi with Mr. E. J. Rowell, Chief of the Programmes Division of the Information Office of the Production and Marketing Administration, U.S. Dept. of Agriculture, learning Market News Service

By

R. T. MIRCHANDANI

Directorate of Marketing and Inspection, New Delhi

IN India regular and reliable series of price records are available in some of the important terminal and distributing markets where business is transacted on the basis of rules framed by the local trade associations. From the three port markets of Bombay, Madras and Calcutta and some other markets such as Hapur, the daily forward and ready price quotations of important agricultural commodities are being communicated to the traders in the assembling markets through newspapers, radio, telegraph, telephone and post. The commission agents in the up country markets keep their agents in the smaller assembling markets posted with market news mainly by postcard or letter. From this point, however, the dissemination of market information rapidly deteriorates and written word is replaced by verbal communications only. This is all for the benefit of the trading class and the producer's needs remain unattended. The cultivator normally gets his market news from his friends as may have lately visited a market or from the village merchant or a passing itinerant trader. It is obvious, therefore, that in the villages and in the primary markets where all the agricultural commodities produced in India are marketed and where the produce changes hands for the first time and passes from farmers to the traders, the market information that filters through to the producers is not only out of date but in most cases inaccurate and biased. Lack of current market information is also responsible for absence of fair and free competition in the villages. The farmers have to accept the price offered by their commission agents and have no means to check the ruling prices. The disparity in the prices of the same commodity in different markets and the wide price spreads which so frequently exist between the prices obtained by the producer and those paid by the consumer go to indicate that market intelligence leaves much to be desired. If the producer is to get better prices for the fruits of his labour, it is of the utmost importance that he should receive more adequate, quicker and more intelligible information in this respect. While the market intelligence as organized by the trade is available for important commodities, no such information is, however, available for fruits, vegetables and livestock and its products which are generally traded on consignment basis.

It will be interesting to know what the U. S. Government has done for their farmers in this regard and the benefits that accrue from such a service.

MARKET NEWS SERVICE OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

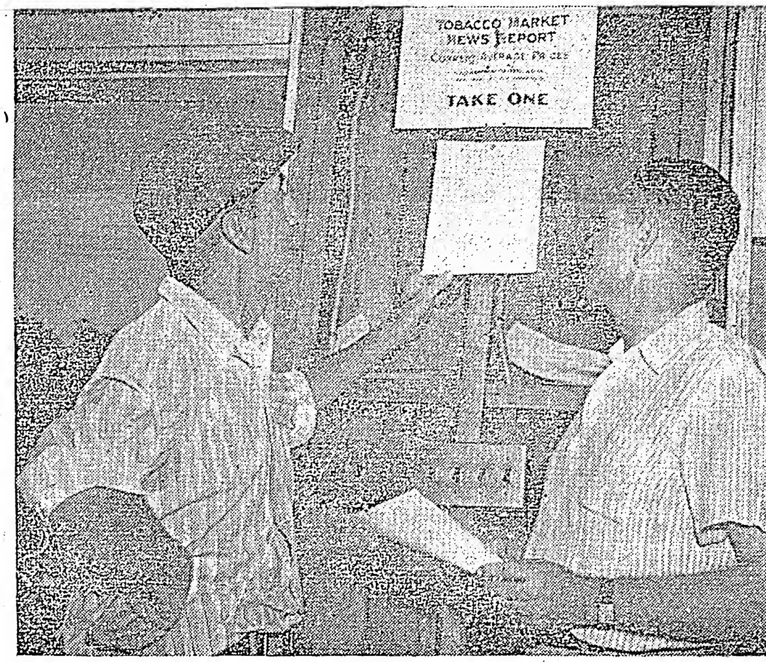
To promote orderly marketing with ultimate object to achieve effective distribution and fair pricing of farm products essential for efficient and increased production,

Note:—The author made a special study of the Market News Service of the U. S. D. A. during the course of his study tour in the U. S. A. under the auspices of Technical Cooperation Administration.

the Production and Marketing Administration of the United States Department of Agriculture (U. S. D. A.) carries out several marketing services and other programmes dealing with all phases of marketing from farm gate to the retail food store. The Market News Service is one of the main and efficient marketing services of the U. S. D. A. for the farmers in the U. S. A. It consists of collecting daily prices of agricultural commodities and other market information on price determining factors such as supply, demand, receipts and movements, in terminal, regional and local markets, and disseminating the same as promptly as modern communication facilities permit.

To keep the farmers fully and promptly informed about the trends and other important changes in market conditions the U. S. D. A. maintains quite an extensive organization. From a small beginning made in 1915, the service has expanded to report complete market information relating to movement, supplies, demand, quality and price quotations and trends on over 100 commodities. More than six million farmers in the U. S. A., many of them hundreds of miles from the large consuming centres are dependent upon timely market news presented in a simple and useful form. One hundred and seven year round and 43 seasonal offices located in 85 cities operate every year for the purpose. Over three million dollars are spent annually on the service. Over 35,000,000 mimeographed reports are mailed to interested persons and institutions every year. Over 1,000 daily papers mostly serving the farming areas publish as a regular feature, U. S. D. A. market news. For quick transmission and dissemination of market news the market news offices are linked by leased wire of about 11,000 miles, with teletyping arrangements. In the State of California the market news offices are connected by short wave telegraph radio system.

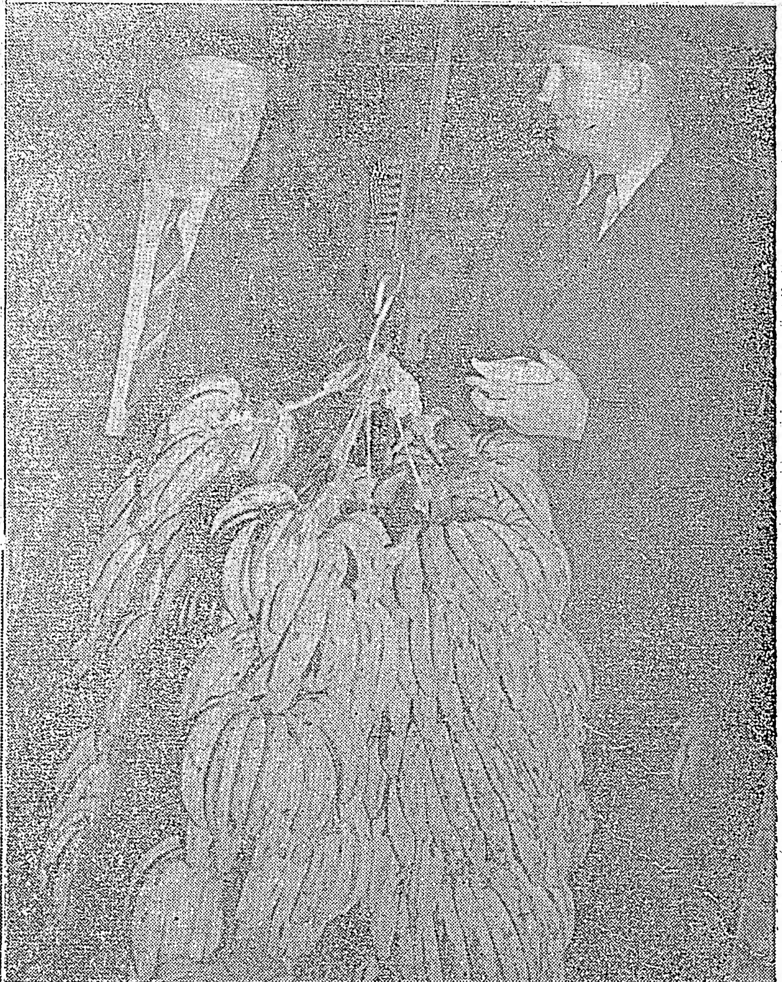
It is interesting to watch the activity that goes on daily—Monday through Friday every week—behind the service. A U. S. D. A. market reporter is out in the produce market or in the stock-yards much before the sunrise. He may be seen with a note book in his hand, moving among the buyers and the sellers and gathering and checking the market information on prices, supply, demand and other points. In the market news office, every one works against the dead line and a visitor can feel the speed at which the work goes on. The market reporter may be seen making a number of telephone calls, contacting distantly located merchants, processing plants, chain-stores and cooperative organizations, for information on prices and other market conditions. Market receipts from various transport agencies, processing plants, warehouses and cold storage plants are collected on another telephone. Calculating machines are used for totalling and averaging quickly the figures collected. The market information from other competitive and terminal markets is received on the teletypewriter and extracts picked up for inclusion in the local report. After all the information is gathered it is analysed and market report prepared for release. The report is immediately transmitted on the leased wire from where it could be picked up by other offices. Generally between 1 and 3 p.m. the market reporter will be busy in transmitting the report on the phone or by special messengers to local broadcasting stations, newspapers, press agencies and other interested persons. The press agencies in turn put it on their leased wire from where it is picked by the broadcasting stations and newspapers located in the neighbouring territory. While the market reporter is transmitting the report on the phone in another room the report is mimeographed, and the copies folded and addressed on the electrically operated machines and prepared for mailing to the farmers, tradesmen, banks and other institutions on the mailing list.



Tobacco Inspector directing a tobacco grower where to find the current price

In the dissemination of market news speed is at a premium and every effort is made to get news out while it is timely. Market information is released to the public through mailed mimeographed reports, newspapers, radios, telephone, telegraph and bulletin boards posted in the market places and other centres where farmers usually assemble. Radio plays an increasingly important role in the prompt dissemination of market news. The market news could be heard on the radio within less than an hour of the release of the market report. Over 1,300 radio stations

Tobacco Inspectors pointing to the farmer what his grade of tobacco has been selling for



Central American Bananas being weighed at the Atlanta, G., State Farmers' Market

scattered throughout the U. S. A. regularly broadcast the U. S. D. A. market news bulletins. Some radio stations have even provided distant control facilities that enable the market reporters to broadcast directly from the office or local markets. The farmers before leaving for work eagerly switch on the radio every morning at six for the U. S. D. A. market report. The truckers who go out in the country for buying poultry, eggs and other commodities are well posted with the latest market conditions particularly of the terminal markets by means of the radio. After listening to opening livestock

Florida Bliss Triumph Potatoes

market report a farmer can rush his hogs or beef cattle to the nearest market.

Both the farmer and the tradesman benefit from the service. It has strengthened the farmers' bargaining position and has put them on equal basis with those to whom they sell their produce. The price information, available grade-wise, helps them to judge approximately the return they should expect from their crop. It also induces them to produce better quality crops and thus raise the standard of farming. The farmers or their agents through whom they generally sell, by studying market news from alternative markets are able to direct their products to those markets that promise the prospect for highest returns. The service thus helps in the diversion of supplies to the points where these are most needed and thus prevents market shortages and gluts particularly in respect of perishable commodities. As the information is unbiased and is freely available to all, it creates healthy competition between the various buyers to the benefit of the producers. The market information disseminated through the disinterested and unbiased agency of the U. S. D. A. gives a comprehensive picture of local, other competitive and terminal market conditions. The terminal market information provides a means of check on the local handler and assures the farmer that he has received a fair dealing. The reports also provide a background for his judgment in selling his produce at a profitable price and at an opportune time under the then prevailing conditions. The Market News Service also maintains price series and other statistics on essential points for use in administering Marketing Agreements, Price Support and other programmes.

The Service is built up and has grown on the cooperation of the tradesmen. The Department has won their confidence by treating the information passed on by them as confidential and not even divulging it to the courts of law. They, therefore, do not hesitate in communicating to the market reporter the prices at which they buy and sell and their daily purchases and sales.

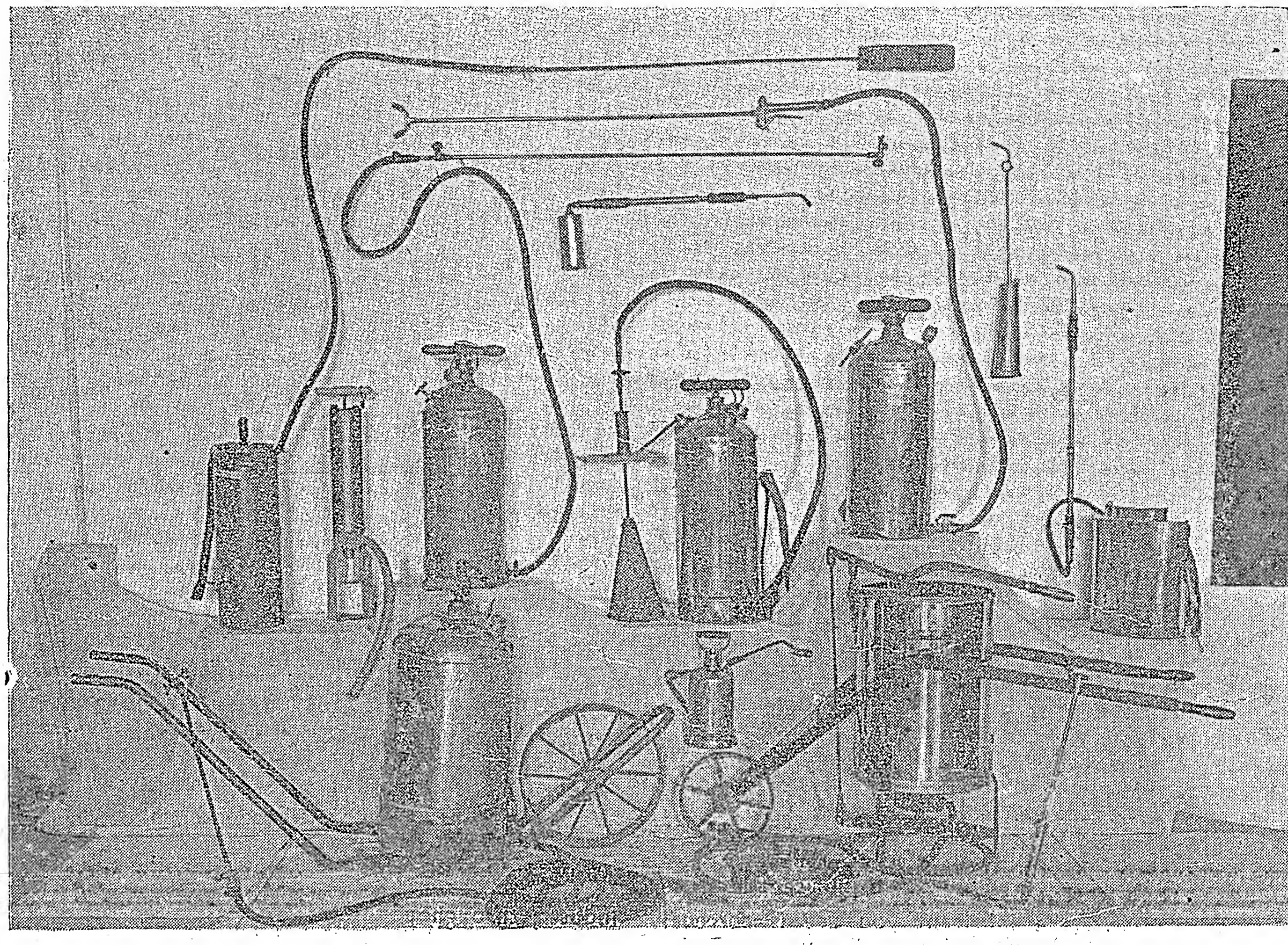
The Service is financed from the funds annually provided by the Congress and contributions made by various participating States—38 in 1951. A major share of the expenditure is met with from the federal funds. This is in recognition of the fact that the marketing of farm products is largely a national or interstate problem and to assure the uniformity, completeness and certainty in service needed to cope with the national marketing problem, the basic core of the service must be a federal responsibility. As users of the service have a fundamental right to receive in return for their taxes, any of the market news data that are collected and which they desire, the service is rendered free and no charge is recovered for the reports supplied except when the information is called for by the user either by air mail or wire or telephone.

Without the realization of a fair price by the producer for his produce all plans to augment the production of food, jute, cotton and other crops are likely to go away. The 'Community Projects' which are now being launched should include in their programme organization of market news service through unbiased agency which would safeguard the interests of the farmers in cooperation with the trade. It is

(*Continued on page 31*)

NEW CHEMICAL WEAPONS FOR FIGHTING INSECT MENACE

By **E. S. NARAYANAN**, Indian Agricultural Research Institute, New Delhi.



THE period 1940-50 will ever be remembered in the annals of applied entomology as a decade when some of the most powerful organic insecticides that were ever at the disposal in the armoury of economic entomologists were discovered. The discovery of these new insecticides has not only opened up a vista for future research in this fascinating problem but has also engendered new hope in the minds of economic entomologists to fight successfully insect invasions which have assumed particular significance in the present context when our country is faced with an acute shortage of food. The importance of the discoveries of these new organic synthetic insecticides lies in the fact that a great stride towards the ideal insecticide appears to have been made and that they possess most of the desirable qualities in insecticides. For, it has never been difficult in the past to find chemicals deadly toxic to insects but what has really been the problem and still remains so is the difficulty to find new compounds, that will give good economic control without causing injury to the host plant, and the insects' enemies, and without hazard to the person handling them.

INSECTICIDE RESEARCH

It may appear from the literature that systematic research in insecticides was taken up only from about the middle of the last century. As a result of ceaseless and devoted endeavour on the part of both entomologists and chemists, galvanized by the necessities of a total war between nations, a number of insecticides approaching the ideal dreamt of by economic entomologists in the last century have been discovered. To mention only a few modern synthetic insecticides we may cite D.D.T. and its analogues, B.H.C. or 666, and its purified

isomers, Chlordane, Toxaphene, Parathion, etc. Though these are mainly contact insecticides their performance even as stomach poisons is so remarkable that they can be used both as contact and stomach insecticides. A good number of them like B.H.C., Parathion, etc. have a fumigant action as well. The modern synthetic insecticides are noted for their very high efficiency in comparatively very small dosages. In addition, some of them are known for their persistent residual action which has opened up a new possibility of building up lethal contact surfaces in preventing infestation. There is indeed a great scope for this in medical entomology and in the preservation of grains in the store that are meant for seed.

Very recently a new class of insecticides known as systematic insecticides is attracting a good deal of attention. These insecticides when sprayed on plants, get absorbed into the sap and prove lethal to the insect sucking the sap. The latest achievement in the field of insecticidal research seems to be a success claimed by La Forge and his associates in synthesizing analogues of the active principles of pyrethrum. The synthetic pyrethrum known as ALLETHRIN is really the allyl homologue of Cinerin I. It has been reported to be as toxic as pyrethrin to house-flies at low concentrations and even more toxic at higher concentrations. Many an attempt made in the past to synthesize pyrethrins had failed but the present success claimed holds a great promise for the future. The key for the solution of the problem of synthesizing compounds with remarkable insecticidal properties appears to lie in the correct understanding of the molecular constitution and configuration responsible for insecticidal activity. There can be little doubt that when this problem is solved we shall be in a position to synthesize insecticides at will that will prove effective against any kind of pest.

IDEAL CONDITIONS DETERMINED

Investigations on insecticides do not stop merely with the finding of better chemicals. Another aspect, equally important, as the chemical synthesis of insecticides itself, is the correct understanding of the conditions, both internal and external to the insect, under which the use of insecticides gives the best results. They include a wide range of complex, such as environmental, physical, physiological and biological. Ideas as to the best time, when temperature and humidity conditions will give the most satisfactory results, suitable formulations and their physical state when they prove to be the most effective physiological state and biological stage when the pest would be most susceptible should be obtained for the efficient and economic use of every new chemical discovered.

Yet another aspect that requires investigation is to establish that the various insecticidal formulations employed are not phytotoxic. Also, since in practice insecticidal applications are often combined with fungicidal treatments, it is desirable to investigate the compatibility of the newer insecticides with the existing commonly used fungicides. Research on these fundamental aspects has received a great impetus after the discovery of the modern organic synthetic insecticides. While research along these lines is of great practical importance in the use of insecticides in general, they are also of paramount commercial importance for the manufacturer to produce insecticides in the required physical state for achieving good results in the field. Indeed, even the agricultural engineer has to play an important role to evolve a suitable machinery for the efficient application of the insecticides at an economically low cost of operation.

In our country, no systematic work on insecticides on the lines indicated above has been done to any appreciable extent. Very few chemists, and no agricultural engineer have bestowed their attention on these important aspects of insecticidal research. Economic entomologists though engaged in testing some of the new chemicals against some of the serious Indian insect pests, appear to have missed, if not neglected, these fundamental aspects. In the Entomology Division of the Indian Agricultural Research Institute, an endeavour has been made, for the first time to initiate research on these fundamental aspects, without which no progress is possible in insecticidal research.

Work has been in progress for some time in the Entomology Division of this Institute, on some of these aspects namely, (*a*) effect of certain chemical and physical factors such as formulations, particle size concentration, etc. on the toxicity of both insecticidal sprays and dusts (*b*) effect of temperature and humidity on insect susceptibility; (*c*) function of the insect cuticle in the toxic action of insecticides; (*d*) efficacy of vacuum fumigation; (*e*) analysis of insects external and internal resistance to the action of fumigants.

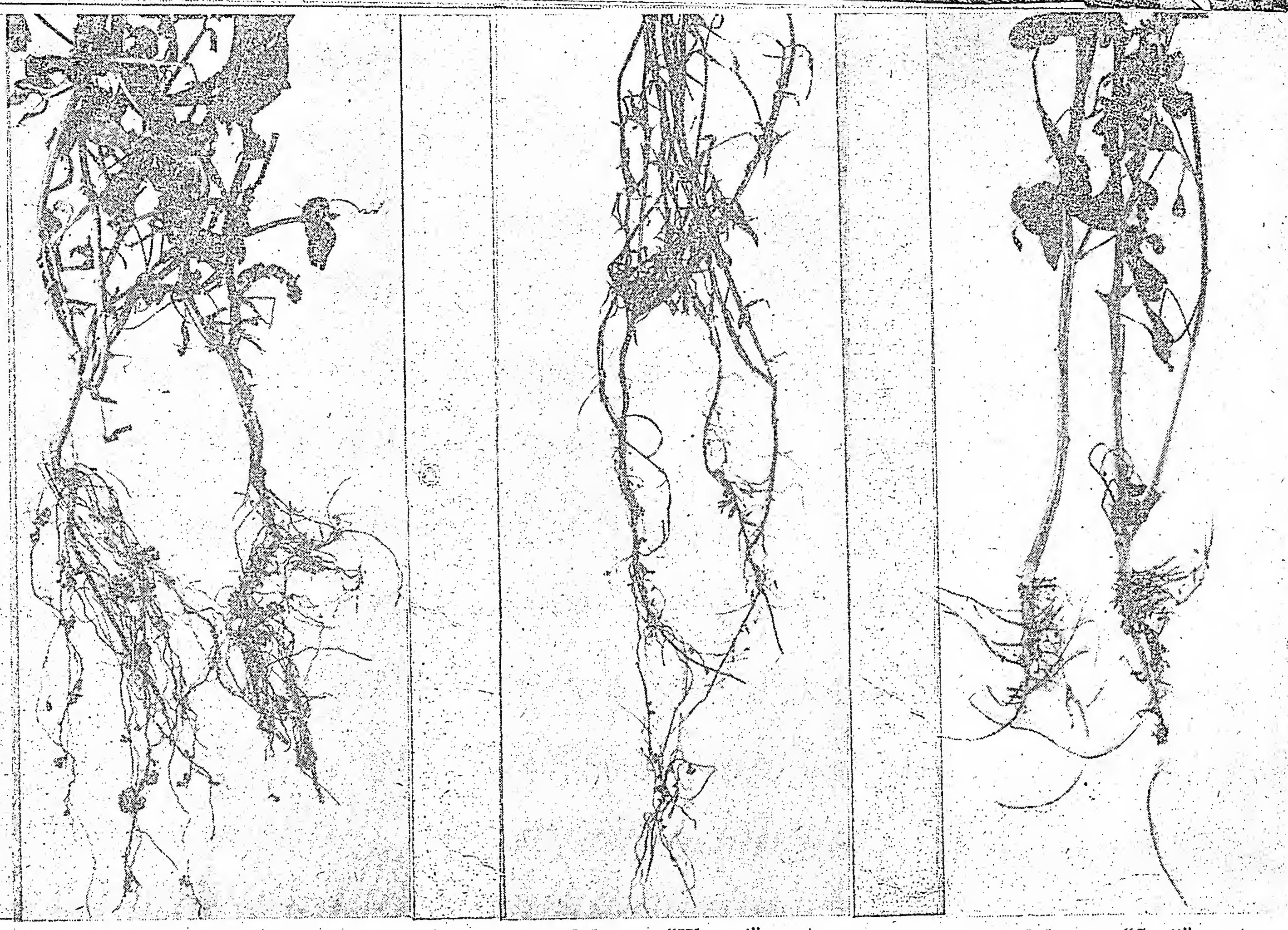
EXERCISE CAUTION IN USE

While research on the above lines is important in the chemical control of the insects, a note of warning should also be sounded in the use of these chemical insecticides. Great caution should be exercised in the use of these synthetics. For, it is now becoming increasingly evident that the indiscriminate use of more and more chemicals in a haphazard manner is creating fresh problems as fast as it is attempted to solve. The insect world, that is dynamic, is capable of producing and is, in fact, producing resistant varieties of species, which after some time, will defy the very poison to which they were so susceptible previously. Possible hazards in upsetting the biological balance in nature or in creating difficult problems of chronic toxicity to consumers of foodstuffs treated or even contaminated, with persistent insecticides as these recent synthetics also have to be carefully borne in mind. These considerations emphasize the need in plant protection work of well-trained technical personnel, who will be in a position to handle these insecticides with the proper discrimination and to the best effect.

IMPORTANT AND URGENT

Subscribers Please :

We have posted renewal reminders to all those readers whose subscriptions have already expired. It will be appreciated if we are advised of the renewal for the new Series Vol. II April 1952-March 1953. All remittances should be sent by M.O. or crossed P.O. in the name of the Agents. While remitting the subscription amount, please quote the subscription No.



Nodules on "Peas" roots *Nodules on "Khesari" roots* *Nodules on "Senji" roots*

DO CATCH CROPS PAY IN ROTATIONS?

By **P. C. RAHEJA**
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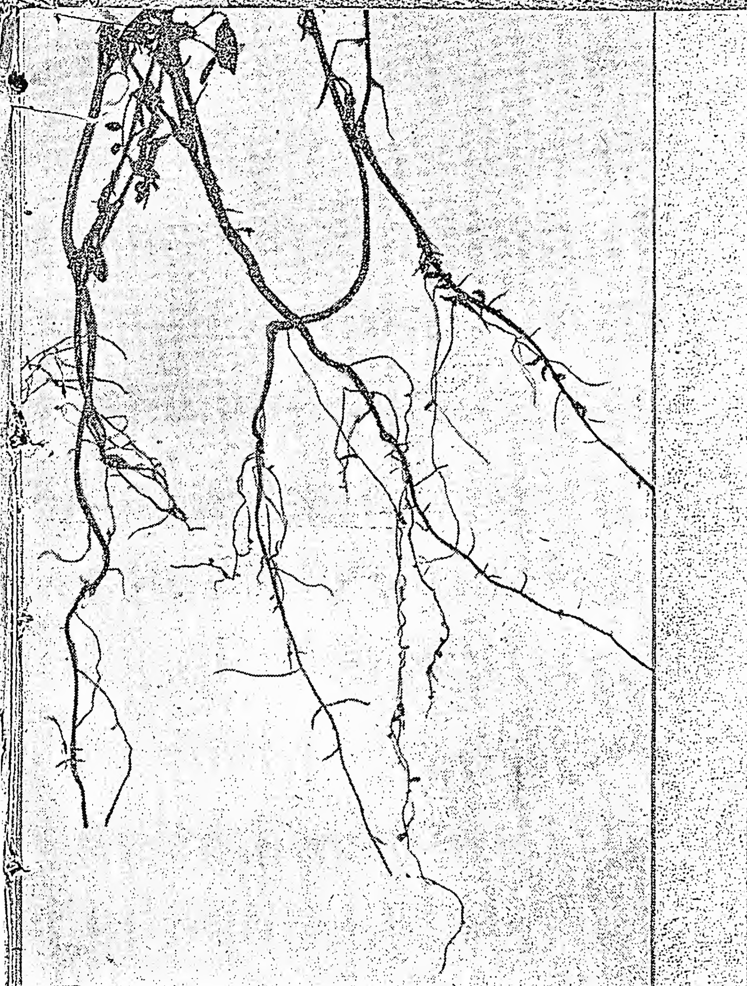
CATCH CROP DEFINED

A SHORT duration crop snatched or raised between two main crops is known as a catch crop. In India the two main crops seasons are *kharif* and *rabi*, when monsoon and winter crops respectively are grown. A catch crop in the normal arable farming is introduced in the period between the two main seasons, when usually the land lies fallow and contributes nothing directly towards the production on the farm. It may provide fodder for cattle, feed for milch stock or food for human beings. When land is left uncropped it gathers strength for future crops. A catch crop, in the interest of remunerative farming, should be such that it builds up the strength rather than exhausts the land of its valuable nitrogen ingredient. The inclusion of a suitable legume crop, which recuperates nitrogen in the soil, as a catch crop between the main cropping seasons is very helpful in preserving soil fertility as a complementary rather than competitive crop.

CATCH CROP REMUNERATIVE

In most parts of the Uttar Pradesh, the wheat tract of Madhya Pradesh, the Malwa plateau in Madhya Bharat and in Khandesh in Bombay State, the monsoon is conserved to take a crop of wheat. The early monsoon cannot be conserved as farmers seldom get an opportunity to cultivate their land, particularly on the black cotton soils. The seeped-in moisture is conserved when monsoon tends to weaken in the months of September. In the Uttar Pradesh the catch crop of *moong* is successfully cultivated on the early monsoon without exhausting the soil of its moisture or nitrogen. The crop yields about 6 md. of *moong* and the yield of the succeeding crop of wheat is enhanced by about 4 md. In the black cotton soils short duration groundnut, *moong* and *urid* do successfully precede the wheat crop and yield a supplementary income to the farmers.

The results of 9 years' experiments under irrigation on two rotations have been compiled to demonstrate that catch crops augment production and net income per acre per year :—



Nodules on "Lentil" roots

YIELD PER ACRE (MD.) AND NET RETURN FOR 9-YEAR PERIOD

Rotation	*Wheat*	*Cotton*	*Toria*	*Senji*	*Net Income per acre per annum in rupees*
1. Wheat-*toria* Cotton ..	23.8	11.2	9.3	..	66
2. Wheat-*toria* Cotton-*senji*	26.5	11.7	9.3	126.3	117

Obviously the inclusion of *senji* as catch crop made substantial contribution to production by increasing the yield of wheat by 2.7 md. and 126.3 md. of nutritious green fodder.

IMPORTANT FODDER CATCH CROPS

Some of the important fodder catch crops in the *kharif* season are cowpeas, *moth*, *guar* and *soyabean*. The hay prepared from cowpeas and *moth* is very palatable and nutritious particularly for milch stock. Where scarcity of water is experienced *guar* does better than the other three crops. Soyabean is very quick growing and can be easily grazed in the field. It does not require much of chopping. Sowing of these crops can be done very early in the *kharif* season under irrigation. Under monsoon the crops are ready for fodder in 8 to 12 weeks after sowing. All of these are legumes and, therefore, nutritious fodder for cattle. The fodder outturn of cowpeas at the I.A.R.I. farm are shown as under :—

FODDER AND GRAIN YIELD OF COWPEAS DURING THE PERIOD 1940 TO 1948

Fodder crop		Grain crop		
Crop duration in days	Average fodder yields md./acre	Crop duration in days	Average grain yield md./acre	Additional fodder yield md./acre
85.0±6.26	162.75±10	130.2±9.25	8.7±1.7	82.0±2.15

Cowpeas on the average required 12 weeks for fodder and 20 weeks for grain production. Sown for fodder in early July the fodder crop is harvested by middle of September. Thereafter land is prepared for succeeding wheat crop. The average yields of wheat after cowpeas fodder have been 22 md. as against 20 md. after fallow. Moth and soyabean hardly take 8 weeks for producing about 75 md. fodder yield. They leave more time for cultivation of land for the succeeding *rabi* cereal.

Sawank is non-leguminous catch crop which is extensively cultivated in the Eastern Uttar Pradesh under irrigation immediately after *rabi* harvest. The fodder crop matures in 40 to 50 days to provide green fodder in the early *kharif* season and 60 days for grain production. Sawank is generally raised as grain crop immediately after peas and harvested sufficiently before the *kharif* crop is sown.

In the winter season *methi*, *methra*, *senji* and *shaftal* are raised as catch crops. They are undersown in the standing crops of maize, cotton, *jowar* and *bajra*. They provide from 100 to 250 md. of green leguminous fodder without preparatory tillage or manuring. In the Eastern Uttar Pradesh, Bihar and West Bengal green peas and *khesari* are cultivated as fodders after paddy and maize crops. They withstand delayed sowings and are able to mature as fodder without irrigation. The yields of late sown peas and *khesari* grain crops at I.A.R.I. which are mostly raised on residual monsoon moisture after the *kharif jowar* crop were as under :—

PEAS AND KHESARI YIELDS FOR GRAIN ON RESIDUAL SOIL MOISTURE

Crop	Mean date of sowing	Mean date of harvesting	No. of Crops	Mean grain yield md./acre
Peas	.. Nov. 16	March 26	9	19.03±1.77
Khesari	.. Nov. 21	May 5	3	9.7±2.70

Obviously the yields of peas sown late after *kharif* were quite high. Khesari is less suitable to Delhi conditions. It is cultivated mostly in North-East India, where it yields as much as peas crop.

In South India black gram and green gram are taken as catch crops. Their requirements of water and manure are practically nil. They being leguminous crops, in fact, enrich the land. These crops on the average yield 5 md. per acre. For full utilization of residual moisture gram crop should be taken after the main season crop. The crop rotation experiments at Lyallpur have given more remunerative returns by inclusion of gram than by keeping the land fallow.

Outturn and net income for the 12 year period

Rotation	Outturn of crops Md.			Net income per acre per annum in rupees
	wheat	cotton	gram	
Wheat-Fallow Cotton ..	23.7	17.4	..	176
Wheat-Gram Cotton ..	24.0	13.4	21.3	184

Grain crop of gram compensated for the loss in yield in cotton crop and enhanced the net income per acre. In areas where winter rains are seldom received *arhar* is grown as a catch crop with *bajri*. The former utilizes the residual moisture and matures to give extra return.

OTHER BENEFITS

Substitution of a catch crop on a fallow reduces substantially rain water erosion from most of the rich flat lands. Such crops keep down weed growth when during monsoon most lands cannot be given frequent and timely cultivation. By including suitable legumes the fertility of the land is kept maintained. Growing of clovers particularly builds up soil structure. By including catch crops in the rotation the farm labour and bullock power remain engaged evenly and full throughout the year and the farmer obtains higher return on his capital. In the event of failure of rains in proper season the catch crop provides supplementary food for human beings and cattle. Catch crops such as *arhar*, gram, etc. are successfully grown on residual moisture after the *kharif* crop.

HINTS TO THE FARMER

(*Continued from page 9*)

for the same reason. Sowing should be done in 2 or 3 small lots rather than a large general sowing. This will ensure more regular supply of fresh vegetables.

Depth of sowing will depend on the size of the seed and type of the soil. (As a general rule, covering should be 3-5 times the diameter of a single seed.) A little deeper sowing should be done in the sandy soils than heavy soils.

(*iii*) *Apply irrigation with very fine spray and only enough to keep the soil moist*: Over irrigation is just as harmful as too little irrigation.

Transplanting should be done when the seedlings can be conveniently handled usually when they have developed 4-6 leaves. If possible, transplant on a cool and cloudy day or late in the afternoon. After transplanting land should be irrigated immediately.

Keep a few spare plants in the nursery to replace any casualities in the plot.

IRRIGATION

There is no hard and fast rule about the frequency of irrigation. Irrigation should normally be applied when the upper layer of the soil shows signs of drying up. Give deep irrigation so that the water permeates through the soil right down to the root level. Shallow irrigation which leaves the root zone dry is of no value.

HOEING AND WEEDING

Frequent hoeings are very essential. Hoeing helps in various ways—(*i*) weeds are removed; weeds rob the soil of the plant food, harbour pests and diseases, and if allowed to grow unchecked, smother the plants, (*ii*) the soil is opened up for better aeration and the root system develops and (*iii*) the evaporation of the soil moisture is considerably checked.

TOP DRESSING

One or two top dressings with quick acting nitrogenous fertilizers like ammonium sulphate will usually be of great value to the crop. Fertilizer should be applied near the root without coming in direct contact with the leaves. As already pointed out such fertilizers should be used very sparingly. A handful of ammonium sulphate is generally sufficient for one square yard of land. Mix the fertilizer in the soil by light hoeing and irrigate immediately afterwards. But the right time for top dressing is when the plants are well established and the growth is rapid, and also a little before flowering. At these periods the food requirements of the plants are high and a little extra nourishment will greatly help.

HARVESTING

Vegetables should be gathered frequently and not allowed to get coarse and stringy. If seed formation starts most of the food material is diverted to this process. The bearing period is, therefore, reduced.

CONTROL OF PESTS AND DISEASES

If the following precautions are taken the attacks of pests and diseases will be greatly reduced:

(*i*) *Use clean seed*: Select disease-resistant varieties.

(*ii*) *Use of unrotted farmyard manure should be avoided*: Unmade farmyard manure attracts white ants and other grubs. Also make sure that no diseased material is dumped into the compost pits, otherwise, it will serve as a source of infection to the plants when you use it.

(*iii*) *Practice rotation of crops*: It is important not only for maintaining fertility of the soil but also for the control of pests and diseases.

(*iv*) *Dust occasionally*: Occasional dusting with finely sieved wood ashes with little D. D. T. or Gammexane will keep away the insects. Again, be very careful in the use of insecticides. If overdone, they may also kill the insects which are essential for the fertilization of flowers. It is advisable to consult some expert such as a representative of Agricultural Department, before any large scale use of insecticides or fungicides is undertaken.

(*v*) *Clean cultivation and frequent hoeings will greatly help in keeping down insects and pests.*

(*vi*) *Over-growing in the nursery or the field should be avoided*: Free movement of air among the plants and easy availability of sun rays are very essential for healthy growth of the plants.

(*vii*) *Over-irrigation is always harmful*: Plants growing under too wet conditions do not show healthy growth.

(*viii*) *Uproot any diseased plants as soon as you see them*: Do not dump them in the compost pit. Burn or bury them.

(*ix*) *Avoid overdozing with nitrogenous fertilizers*: Feeding with too much of nitrogen results in soft, unhealthy, vegetative growth which is more readily attacked by pests and diseases. Phosphates and potash, on the other hand, help the plants to develop stronger tissues which resist the attack of pests and diseases.

CHART GIVING CULTIVATION DETAILS OF COMMON *RABI* VEGETABLES

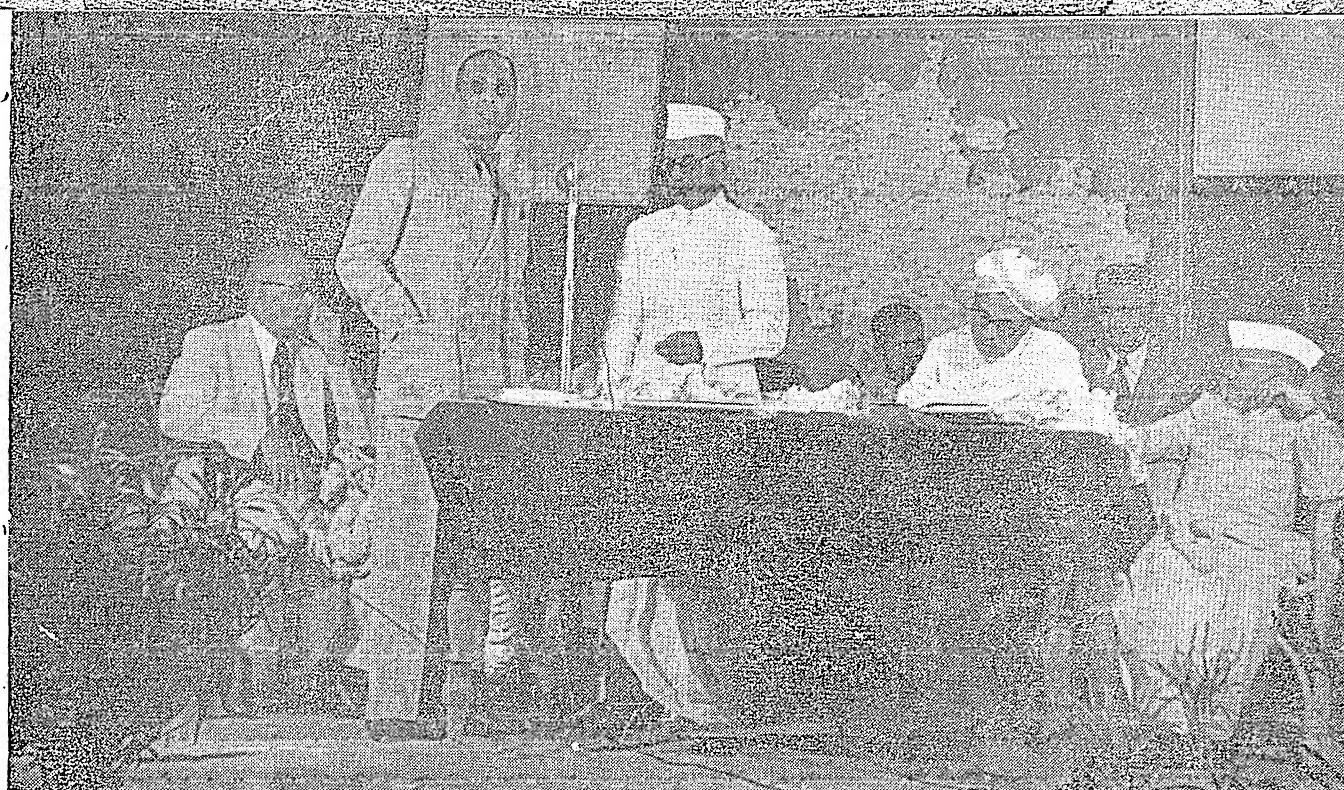
Name of the crop	Sowing season	Seed rate per acre	Method of sowing	Distance between rows	Distance between plants	Manuring (F.Y.M. cartloads)	Ready for harvest	Varieties recommended‡	Remarks
1	2	3	4	5	6	7	8	9	10
(a) **Root Crop**									
1. Potato (Alu)	Sept.-Oct. & Jan.-Feb.	6–9 Md.	D* On ridges	$1\frac{1}{2}$–2′	6–9″	30–40	Jan.-Apr., May	Gola, D. R. R. Phulwa, Simla special (up-to-date).	Golashould be planted early for January harvest followed by D.R.R. Simla special and Phulwa.
2. Carrots (Gajar)	Aug.-Jan.	6–8 sr.	D	9–12″	2–3″	20–25	Nov.-Apr.	"Denvers halflong" "Chanteney," "Early Nantes."	Thinning should be done early.
3. Turnip (Shalgam)	do.	1–$1\frac{1}{2}$ sr.	D	12–15″	4–6″	15–20	Oct.-Mar.	"Golden Ball" "Snow Ball," "Purple Top."	Do.
4. Radish (Muli)	do.	$1\frac{1}{2}$–2 sr.	D	9–12″	2–4″	do.	do.	"Red," "Long Red," "Cincinatti Market," "Scarlet globe (Round type.)"	Of round types only small sowings at 10–14 days interval should be done. They are ready in about 6 weeks.
5. Beet root (Chakandar)	Sept.-Dec.	6–8 sr.	N†or D	12–15″	4–6″	do	Dec.-March	"Crosby Egyptian," "Early Egyptian," "Crimson globe."	Thinning should be done early.
6. Onion (Piaz)	Sept.-Feb.	2–$2\frac{1}{2}$ sr.	N	6–9″	2–3″	25–30	Feb.-June	"Silver skin."	Transplant 6 to 8 weeks after sowing.
(b) **Fruit Bearing Crops**									
7. Peas (Matar)	Oct.-Nov.	8–10 sr.	D	$2\frac{1}{2}$–3′	2-3″	15–20	Jan.-March	"N.P. 29", "Hoshiarpuri" "Telephone," "Early Dwarf," "Laxtons progress" "Little Marble."	For tall types staking is necessary.
8. French beans (France beans)	Aug.-Oct.	10–12 sr.	D	2–$2\frac{1}{2}$′	9–12″	do.	do.	"Dwarf," "Yellow," "Canadian Red."	do.
9. Broad beans (sem)	Oct.-Nov.	do.	D	do.	do.	do.	do.	"79F", "Long pod," "Green long pod."	Staking is necessary

(*See overleaf*)

CHART GIVING CULTIVATION DETAILS OF COMMON *RABI* VEGETABLES

Name o the crop	Sowing season	Seed rate per acre	Method of sowing	Distance between rows	Distance between plants	Manuring (F.Y.M. carloads)	Ready for harvest	Varieties recommended‡	Remarks
1	2	3	4	5	6	7	8	9	10
10. Tomato (Timatar)	July.-Oct.	12-16 oz.	N	$2\frac{1}{2}$-3′	2-$2\frac{1}{2}$′	25-30	Nov.-April	"Siox", "Ponderosa" "Best of All", "Large red", "Marglobe", "Alliance."	Transplant six weeks after sowing. Plant should be protected against frost.
11. Brinjal (Bengan)	July-Sept.	do.	N	do.	do.	do.	Dec.-April	"Pusa purple", "Black beauty."	Transplant six to eight weeks after sowing.
(c) **Cauliflower & Cabbage family crops**									
12. Cauliflower (Phul Gobi)	June & Oct.-Nov.	8-12 oz.	N	2-$2\frac{1}{2}$′	$1\frac{1}{2}$-2′	30-40	Oct.-March	"Kataki", "All the year round", "Snow ball".	Only Kataki is sown in June. Transplant 6-8 weeks after sowing.
13. Cabbage (Band Gobi)	Oct.-Nov.	do.	N	do.	do.	25-30	Dec.-March	"Early Jersey Wakefield", "Copenhagen Market" "Savoy Drum head."	Transplant 6 to 8 weeks after sowing.
14. Knol Khol (Ganth Gobi)	Aug.-Oct.	do.	N	1-$1\frac{1}{4}$′	4-6″	do.	do.	"White Vienna", "Early White Vienna", "King of Market".	do.
15. Brussel Sprout (Guncha Gobi)	Oct.-Nov.	do.	N	2-$2\frac{1}{2}$′	$1\frac{1}{2}$-2′	25-30	do.	..	do.
16. Broccoli	do.	do.	N	do.	do.	do.	do.	..	do. Remove central head and later side head.
(d) **Salad and leafy vegetables**									
17. Spinach (Palak)	Aug.-Jan.	10-12 sr.	D	9-12″	2-3″	15-20	Nov.-April	..	Also sown broadcast Thinning should be done early.
18. Fenugreek (Methi)	do.	9-12 sr.	D	do.	1-2″	do.	do.	..	do.
19. Lettuce (Salad)	Sept.-Dec.	4-6 oz.	N	12-18″	10-12″	do.	do.	..	..
(e) **Aromatic and Flavouring crops**									
20. Chillies (Lal Mirch)	May-June	1-2 sr.	N	$1\frac{1}{2}$-2′	1-$1\frac{1}{2}$′	10-15	Sept.-Feb.	..	..
21. Coriandar (Dhania)	Sept.-Nov.	8-12 sr.	D	1-$1\frac{1}{2}$′	6-8″	do.	Dec.-Feb.	..	Can be sown in rows also.

*D—Sown direct in the field. †N—Sown in nursery and then transplanted.
‡—Varieties recommended.—Only varieties tried in Division of Botany, I.A.R.I. and found good are mentioned here.



Shri K. M. Munshi inaugurates the "Key Farm" scheme at Hessarghatta

KEY FARM IN MYSORE

THE HON'BLE K. M. MUNSHI, Minister for Food & Agriculture, Government of India, inaugurated the "Key Farm" Scheme at Hessarghatta situated at a distance of 16 miles from Bangalore, on the evening of 27-4-52.

The "Key Village" at Hessarghatta is a compact area consisting of contiguous villages chosen for the Development of good cattle—specially Stud bulls. The scheme is a comprehensive plan jointly undertaken by the Union & State Governments on 75 : 25 basis for the first year and 50 : 50 basis for the subsequent years with a view to concentrating the available resources to a limited area for achieving quicker results so that the villages chosen may function as a supply base of bulls for other surrounding areas.

The Farm at Hessarghatta, which is a Composite Livestock Farm & Research Station is one of the two centres in Mysore State, the other being a Cattle Breeding Station at Ajjampur. About 24 villages have been chosen for the purpose in each Centre.

The work contemplated under the scheme in the two centres during the initial stages includes, among others, the starting of Veterinary Dispensaries, Survey of cattle population, distribution of stud bulls artificial insemination, opening of Calf Nurseries, and Go-sadans where unfit cattle will be maintained, so that they will no longer be a drain on the limited fodder resource of the villages.

According to Dr. P. M. Narainswamy Naidu, Director of Animal Husbandry Services in Mysore, States like Bombay and Madras, depend largely on Mysore cattle for their agricultural pursuits and it was estimated that Mysore exported annually about a hundred thousand pairs of bullocks to these two States. The cattle population within the State Boundaries amounted to 5.8 million head or 64 for every hundred human population. Despite such a large cattle population in the State its record of per capita consumption of milk is the lowest, and while the average annual production per head in India is less than 30 gallons, in Mysore it worked out to less than five gallons. The per capita consumption of milk is only about an ounce in the State compared to 5.6 ounces for the whole country.

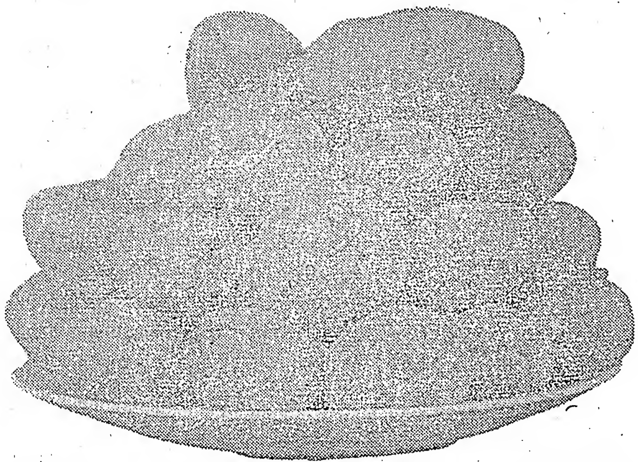
Inaugurating the Scheme, Shri Munshi paid a tribute to the State's Animal Husbandry organization which he considered as being far ahead of similar organizations in any other State in the country. Mysore, he said, is, perhaps, the only State which had strenuously tried to translate into action the Linlithgow Commission's recommendations to have a veterinary dispensary for every 25,000 head of cattle. He commended the efforts made at the Hessarghatta Farm, which, he considered to be perhaps one of the potentially best multipurpose farms in the country, where the development of all species of animals was being carefully co-ordinated.

The need for protection and development of cattle in India is great and for this purpose, it is necessary among other things, to provide good stud bulls to eliminate cattle disease and to develop extensive pastures. Under the Key Village Scheme in another ten years it is hoped to produce 60,000 stud bulls.

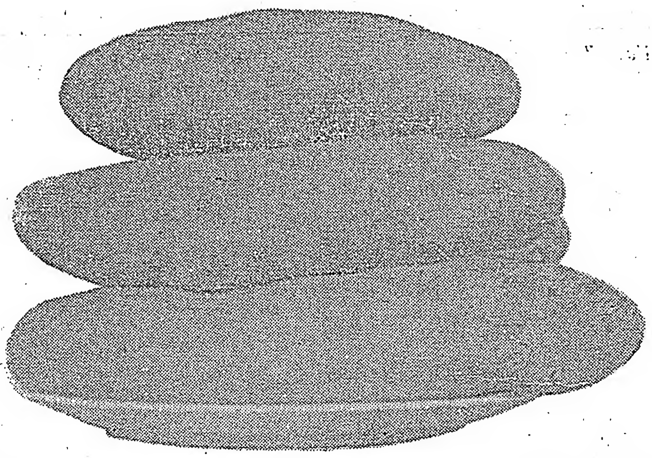
SEED POTATO DEVELOPMENT IN HIMACHAL

By

PUSHKAR NATH



Good seed stock of disease-free strain of Up-to-Date



"Delaware" produces large, long oval tubers. Each tuber may weigh 1-4 lb.

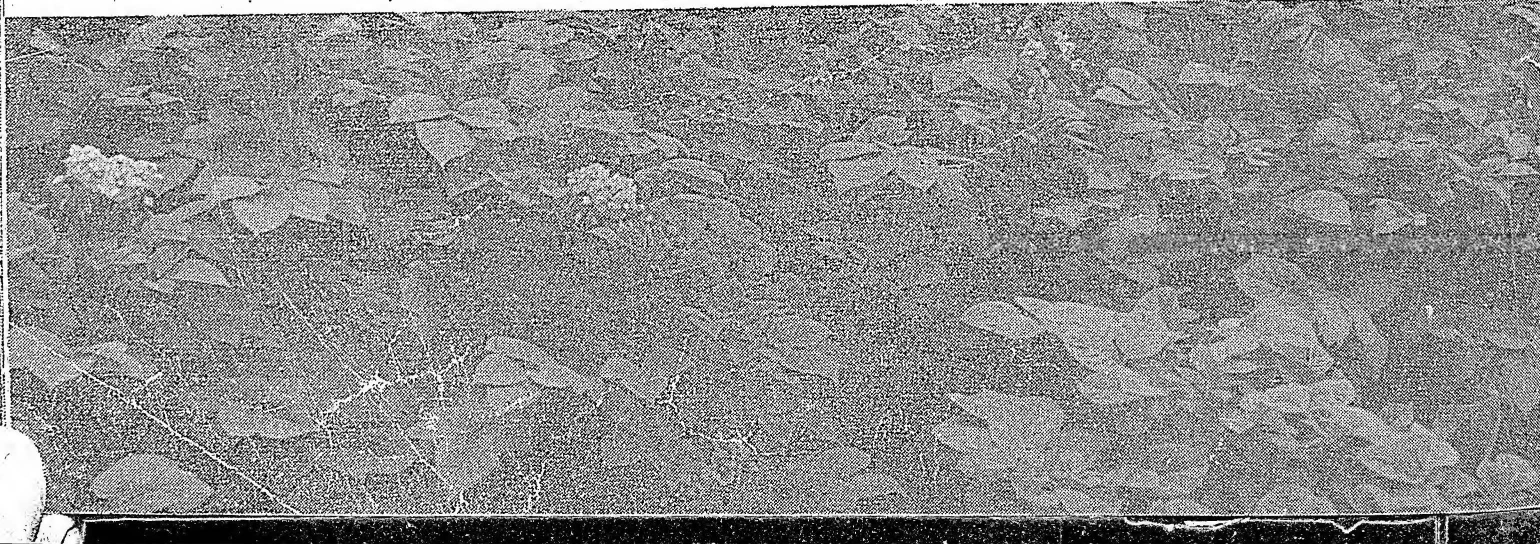
THE Scheme for Potato Development in Himachal Pradesh aims at stepping up yields by the application of scientific methods and organizing a planned system for production and standardization of seed potatoes. This scheme, which was initiated in 1949, has registered very good progress and is expected to meet the expenditure involved from the income anticipated.

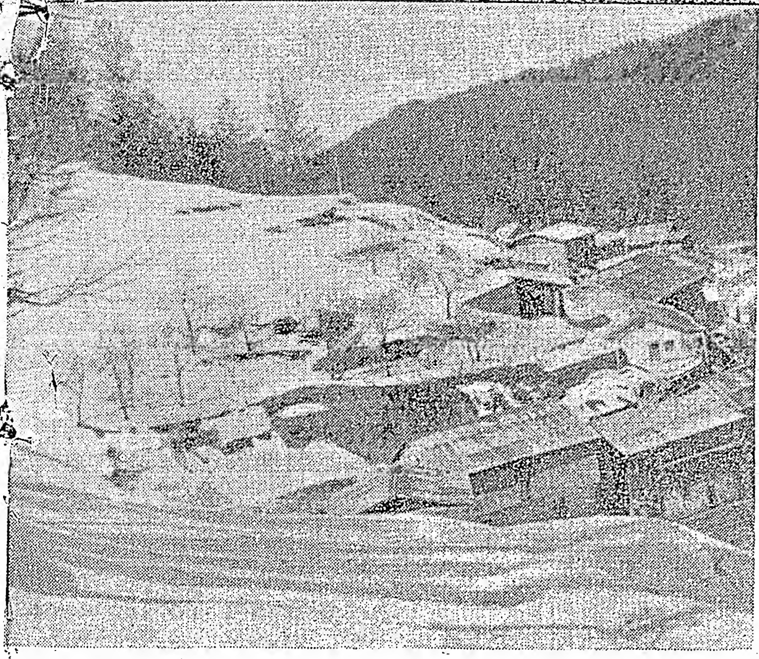
HIMACHAL—THE TRACT FOR QUALITY SEED POTATOES

Himachal enjoys an ideal climate which largely satisfies the technical requirements for production of high class seed. The State has already established a reputation for high grade seed potatoes. When, as a consequence of war, Bombay found its supplies of seed potatoes from abroad suddenly and completely stopped, it had to look to Himachal—although about 1,500 miles away—for seed potatoes. Why did Bombay not develop its own seed trade and build up a series of cold stores, or even secure stocks from the neighbouring provinces? The answer is simple. Due to high incidence of virus diseases (which will be referred to later), the seed stocks 'degenerated' and did not, therefore, give as good yields as the Himachal seed potatoes. Today Himachal supplies the needs of about 15,000 acres, more than ¾th of Bombay's *rabi* potato acreage.

Bombay is by no means the only State which appreciates the value of Himachal seed potatoes. West Bengal receives almost double the quantity exported to Bombay. Besides, most of the Central and South Indian territories, where seasonal conditions permit the use of Himachal seed potatoes, are drawing their share from this hill State.

Uniform, healthy vigorous stand (Up-to-Date D.F.S.) results through use of disease-free stocks





Severe winter followed by a cool summer, (usual at heights of Kufri), provides conditions to build up disease-free stocks

QUALITY SEED POTATOES DEFINED

Two essential requirements of seed potatoes are that (1) they should be true to the type and (2) free from 'degeneration' diseases. At present there exist no organized agencies which would guarantee both these demands. There prevails great confusion regarding the varieties under commercial use in this country. The same variety is often designated by several names and different varieties are grown under the same name. The prevalent varietal confusion not only largely nullifies production but is also a source of loss of capital to an already sorely tired cultivator. Selection of right type of varieties and their maintenance at a high level of purity at all stages of multiplication is, therefore, the first essential.

Choice of right type of varieties cannot by itself help if the stocks are 'degenerated'. 'Degeneration' of potato stocks is now known to be the result of a group of virus diseases which can be recognized in the growing stage of the crop by certain characteristic symptoms like mottling and deformation of leaves (crinkling and rolling of leaves). Diseased plants invariably show marked loss of vigour. In the field the diseased plants act as sources of fresh infection; and rapid dissemination of infection from the diseased to healthy plants is possible through the agency of certain sucking types of insects known as *aphids*. The number of virus diseases known to infect potato is large, but only four of these are important from the commercial point of view in this country. These, either individually or collectively, are responsible for rapid fall in yields. At present crops are riddled with virus diseases and it is a waste to spend money and energy on seed stocks not known to be disease-free.

Besides being 'true to type' and free from 'degeneration' diseases, quality seed potatoes must be properly graded and free from dust and other fungal and bacterial diseases which otherwise lower the value of stocks.

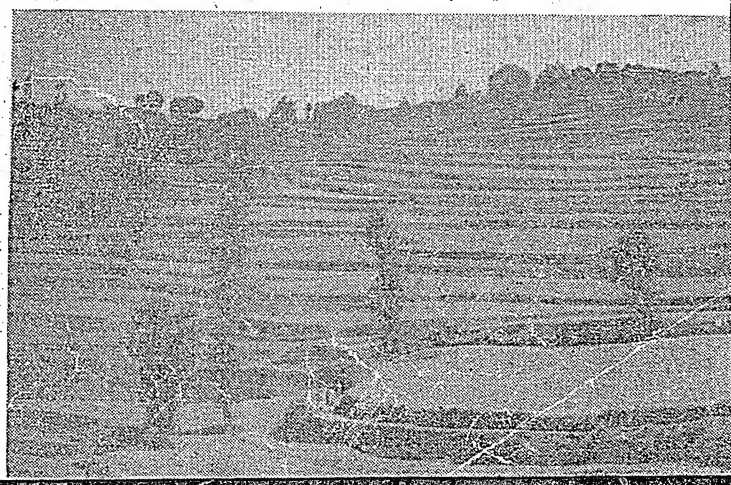
THE HIMACHAL SCHEME FOR SEED POTATO PRODUCTION

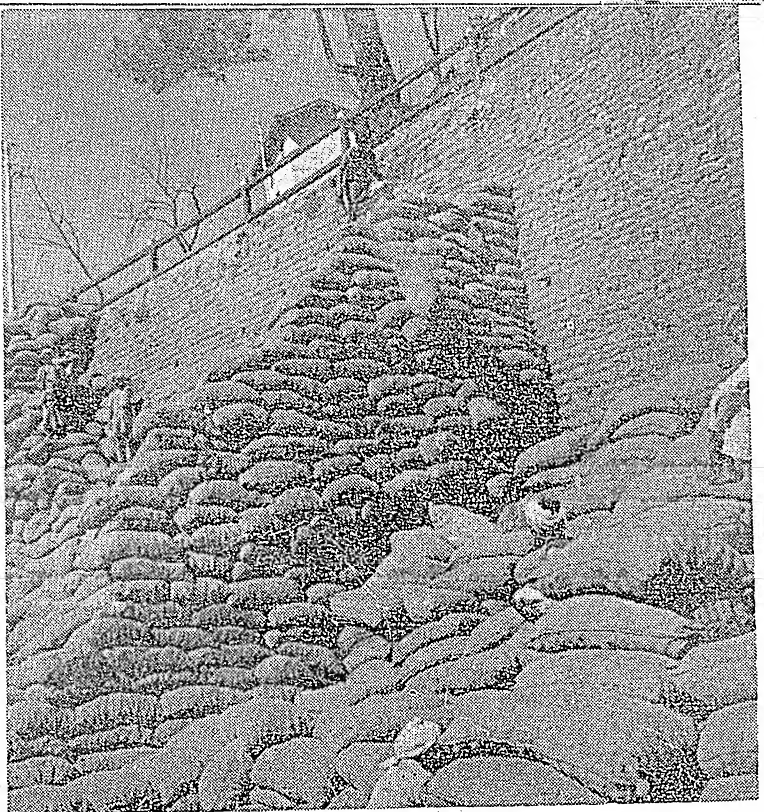
The Himachal Scheme undertakes to multiply the mother stocks from tested foundation stocks produced annually under expert supervision. This is being done by the cooperative effort of the Central Potato Research Institute and the Himachal Government—the former being responsible for the maintenance, testing and building up of foundation stocks and the latter for their multiplication and distribution. The various stages of work being:

Stage I—Testing and production of foundation stocks—Since the virus diseases are carried from diseased to healthy plants through the agency of small green flies known as *aphids*, it is, therefore, necessary to undertake the testing and building up of disease-free foundation stocks in such localities where natural incidence of *aphids* is low. *Aphids* can survive under a variety of climatic conditions and are particularly abundant in warmer regions thus rendering large part of the plains of India unsuitable for production of healthy seed stocks. Broadly speaking, the condition which must be fulfilled where *aphids* will not thrive are that the site must be cool and that it must be exposed to wind-conditions which retard or even prevent development of virus transmitting *aphids*. For these reasons the Potato Certification Substation of the Central Potato Research Institute has been located in the high hills (at an elevation of 8,500 ft. above sea level) on an exposed site at Kufri (Himachal Pradesh). At this station the technical staff is busy in building up and periodically testing in glass-houses the foundation seed stocks of commercial varieties and hybrids needed for feeding the various development projects of the States.

Stage II—Multiplication of foundation stocks under departmental supervision—Having secured healthy foundation stocks (Stage I of the work) it was necessary to establish a chain of stations or centres for the multiplication of the seed stocks. Two such stations, one at Shilaroo (8,500 ft. above sea level in Mahasu District) and the other situated at an elevation of about 7,500 ft. near about Dalhousie in Chamba District have been established by the Himachal Government. The Himachal Scheme also provides for the setting up of additional Regional Stock Seed Multiplication Stations in such areas where the health standard of seed potatoes can be maintained.

Large scale multiplication is carried out in small, terraced holdings of growers





Endless piling and careless handling is a sure way to ruin good seed stocks

At the Regional Multiplication Stations, the technical staff undertakes (1) to maintain the purity and health standard of the varieties through an organized system of field inspections of the growing crop (2) to secure information of value by carrying out agronomic experiments of local interest (3) to educate the local growers in matters of seed potato production by organizing short practical courses at the Regional Stations (4) to organize and undertake inspection of crop in growers' holdings (Stage III of work).

Stage III—Multiplication in growers' holdings—The stocks secured under stage II are multiplied further in cultivators' holdings. There are two categories; 'Approved Stock Seed Growers' and the 'Registered Growers'. The former are the progressive growers round about each Regional Multiplication Station; and in return for the cheaper rates at which the seed is supplied to them, the Approved Growers undertake to work under the guidance and technical supervision of the Himachal Potato Development Organization and they also render necessary help in periodic inspections and in the removing of 'off type' plants, etc.

The crops raised by the 'Approved Growers' are subjected to close and periodic examination by the technical staff of the Himachal Potato Development Organization and, therefore, the standards of purity and health are nearly as good as the stocks multiplied under stage II of the work. The second category or the 'Registered Growers' receive the produce multiplied in the 'Approved Growers' holdings. If, as a result of crop examination (which is done once or twice during the season) the crops come up to the approved standards of health and purity, they are certified by the Department. For every maund of graded certified seed buyer will be expected to pay the premium of Re. 1; a sum which is to be shared equally by the department and the growers.

It would be seen that through all the stages of multiplication there is an annual replacement of seed stock and the flow of high quality seed potatoes from the original tested stocks, is a continuous and regular process. As the work develops, introduction of some sort of Seed Potato Act, which would make it obligatory on growers in specified zones to grow only healthy seed potatoes may also be necessary.

CHOICE OF VARIETIES

To begin with, the following varieties, are being multiplied:

Up-to-Date (disease-free strain)—Excellent, large, oval tubers which this variety produces under a variety of environment conditions have won it a great popularity. It has a graceful, well balanced foliage which gives a good cover and the variety can thus bridge over short periods of drought. Good tuber production under varying day-lengths has made it possible to grow this variety both under long-summer-day in the hills where it is a main crop variety maturing in about five months, and also under short-winter-day conditions in the plains where it is an early type maturing in about three months. The only drawback of this variety is its extreme susceptibility to late-blight.

Craig's Defiance—This variety is field-immune to a number of virus diseases. Under field conditions, therefore, this variety can never be found infected with certain virus diseases. To such of the viruses to which it is susceptible it reacts markedly and shows distinct symptoms of mottling or rolling of leaves. It is, therefore, fairly easy for field inspectors to rogue out all the diseased plants and thus maintain high standards of health.

In a number of trials conducted by the Central Potato Research Institute this variety showed great promise in Bombay. It is an early maturing variety and responds favourably to short-day conditions. In the plains it matures slightly earlier than Up-to-Date. It has a short dormancy period and it may, therefore, be possible to grow this variety in such tracts where, for reasons of dormancy, hill produce cannot at present be used as seed.

It yields an excellent crop of large sized oval tubers of Up-to-Date type. It is rather more erect than Up-to-Date and can, therefore, be sown at a closer spacing. It has excellent keeping quality and can be easily transported over long distances.

Disease-free nucleus stocks are maintained and annually tested in glass houses at Simla

Recently it was distributed for multiplication to Approved Stock Seed Growers, but under certain soil conditions it develops (sometime extensively) rusty brown spottings (internal rust spots) throughout the flesh. Although the external appearance of the tubers or its keeping quality is almost unaffected, internal rust spotting lowers the commercial value of the produce. For this reason this variety has been withdrawn from general multiplication. It is available in small quantities and may yet prove valuable in tracts where it may not develop internal rust spotting. It is also susceptible to late-blight.

Hybrid 9—This hybrid, bred at the Potato Breeding Substation, Simla, has been selected for its yield and good keeping quality. It does not show any marked effect to virus diseases. It has excellent keeping quality and produces uniform grade of medium size round to oval tubers. Under wet conditions (common in Himachal) this variety, unlike Up-to-Date, does not rot easily. It can, therefore, be lifted later than Up-to-Date and Craig's Defiance. It is here thus that this variety scores over the other two varieties and it constitutes the potato for regions where transport facilities are not easily obtainable and where the clayey nature of the soil would not permit Up-to-Date to be grown. This, however, is not a variety suited for the plains. Unlike Up-to-Date and Craig's Defiance, Hybrid-9 shows considerable resistance to late-blight.

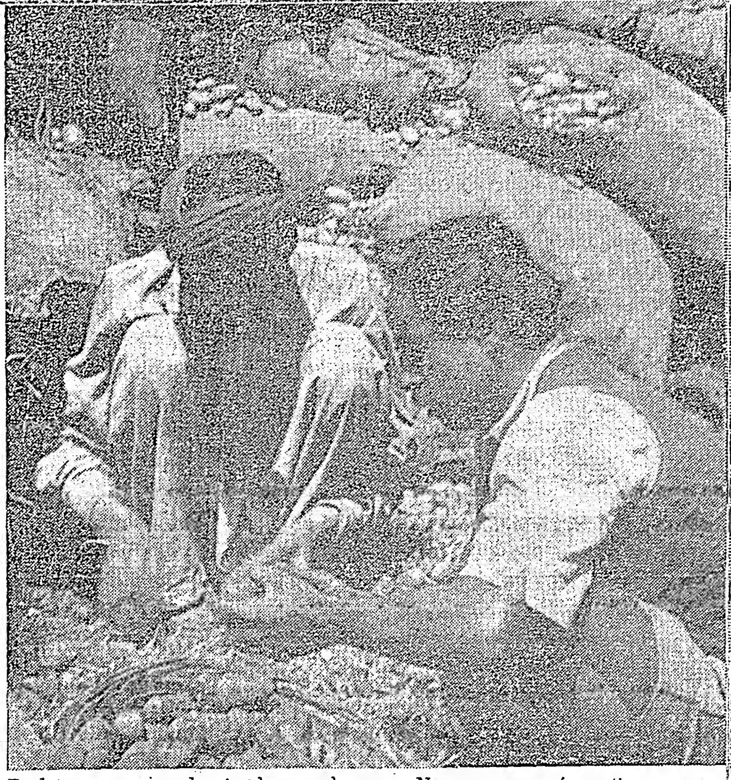
Delaware—This variety was introduced in 1950 from Australia. It gave excellent yields of very large sized, oval, flattened tubers of attractive shape. But both foliage and tubers being very highly susceptible to late-blight, and if infected with late-blight, a high percentage of large sized tubers may rot within a short time in storage. For high yield and excellent tuber size and shape this variety has much to its credit. It is earlier than Up-to-Date.

Under conditions prevalent in the plains where late-blight is not such a serious problem this variety has much to recommend itself. It reacts favourably to short-day conditions and produces a good crop of large and uniform grade of oval shaped tubers within about two to three months. As a substitute for 60-day *satha*, which yields only a low crop of small size tubers, this variety can be tried with confidence.

Besides the above three varieties search is being continuously made to evolve newer and select better varieties of potato and in this connection work is being done by the Central Potato Research Institute under a cooperative programme of applied research and development.

FIELD INSPECTION FOR VARIETAL PURITY AND VIRUS FREEDOM

In order to maintain the purity and, therefore, yield potential of the variety, it is necessary to inspect the growing crops from time to time and rogue out any 'off type' plants as and when recognized. Besides the varietal mixtures it is well known that most varieties throw out 'off type' plants called under different names, 'Bolters', 'Wildings', 'Semi-Wildings', etc. The reasons for frequent occurrence of such 'off type' plants are not very well understood but they can be recognized by trained persons by certain characteristic changes in the foliage and habit of the plant. Such plants



Bad storage results in heavy losses. No amount of sorting and desprouting can restore the vigour of seed stocks

generally yield many but small tubers which, in the subsequent generations yield crop which does not correspond to the parental type. A continuous and vigorous search is being maintained in foundation seed stocks.

There are no practical methods known by which the virus can be killed or inactivated within the tuber. 'Once infected always diseased' is literally true. Periodic examination of the growing crops and 'roguing out' of diseased plants as and when they appear is at present the only practical way to maintain the health standards of the crop. A system of crop inspection on the lines similar to those operating in other progressive countries has been devised by which the crops at the Regional Multiplication Stations are examined 4-5 times during growing season, twice in 'Approved Stock Seed Growers' holdings and once in 'Registered Growers' plots.

As during the growing season several acres of crop have to be examined, it is not possible to do so with the small technical staff available on the pay rolls of the Government Department. Under the scheme, therefore, large number of suitable persons drawn from the local population will be trained and, after short periods of intensive training of 7-10 days at the Regional Multiplication Stations, sent out in batches under the supervision of the technical staff of the Department, to inspect and rogue out the crops and certify the produce for purity and disease.

SECURING AND SATISFYING NEW MARKETS

Freshly harvested potatoes would not sprout for 2-3 months and due to the limitations imposed by the dormancy of the tubers, Himachal potatoes cannot be utilized as seed by the nearer States of PEPSU, Punjab and Uttar Pradesh. The sowing season in these States begins in September when potatoes are

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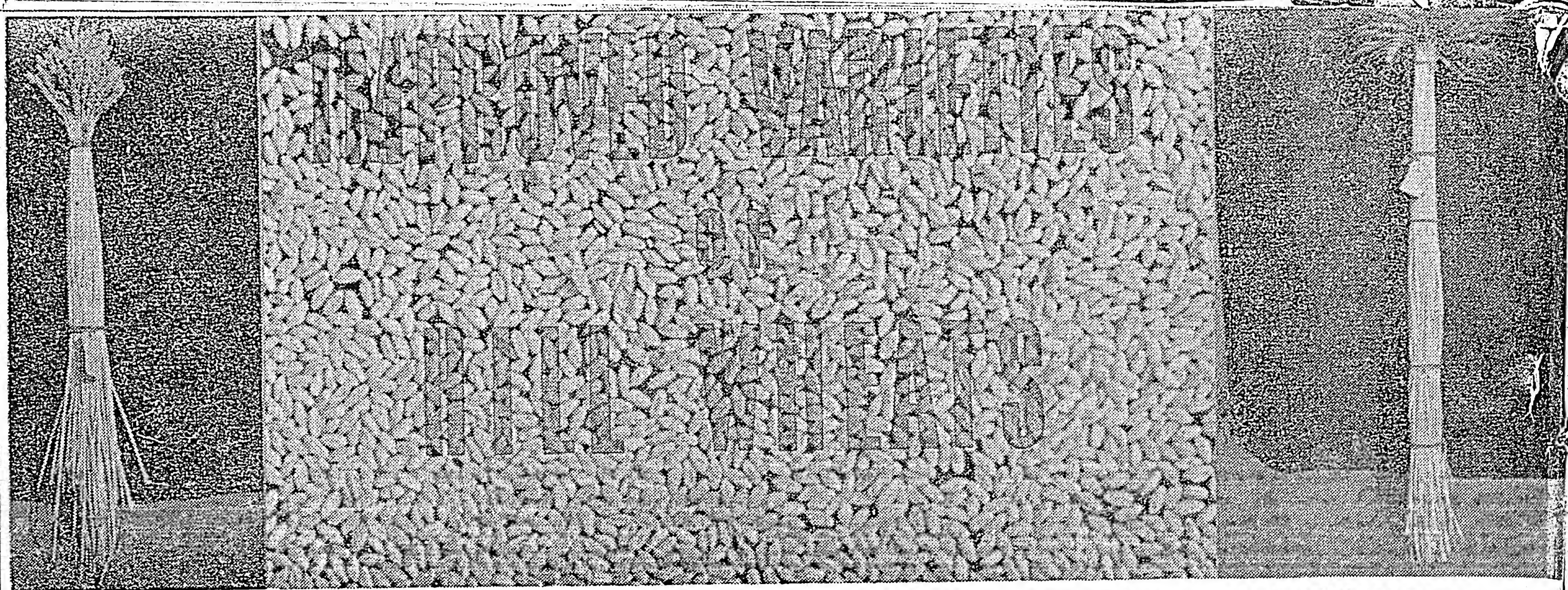


By

SATYA PRAKASH KOHLI

Wheat Breeding Substation, I.A.R.I., Simla

and

M. B. PATKAR

Himachal Department of Agriculture, Simla

WHEAT being the most important crop of north-western India, research work for breeding better quality and high-yielding varieties of wheat, that are resistant to the destructive ravages of the rust diseases, has been going on at the Indian Agricultural Research Institute and several other centres.

The studies of the wheat rusts in India have revealed that the Indian hill crops of wheat and barley serve as the major sources for the production of disease spores which are blown down by the wind from the somewhat early sown hill crops and also from "self-sown" plants of wheat and barley to the plain crops—normally sown a little later. This gives added importance to the necessity of the cultivation of resistant varieties of wheat and barley in the Indian hills. At Simla, the Wheat Breeding Substation of the Indian Agricultural Research Institute has, therefore, been concentrating on breeding rust-resistant strains of wheat and barley for the hills.

The research work at Simla has made available a number of new rust-resistant varieties of wheat, which, besides possessing a high degree of disease resistance, have been seen to combine agronomic suitability and grain quality with high yield. Through the cooperative arrangements with the Himachal Department of Agriculture, initiated in consultation with Dr. Pushkar Nath, observations have been made regarding the general adaptability of these wheats to the varying environmental conditions prevailing at different altitudes (varying from 1,500 to 9,000 feet above sea level) under which the wheat crop is being raised in Himachal. The cooperative trials so far conducted have clearly brought out the superiority of two varieties, viz. Ridley and N.P. 770, to the older varieties and unselected mixtures being grown in this state. Besides, the existing varieties under cultivation are highly susceptible to the attack of rusts and smuts. The cultivation of these new varieties of wheat, therefore, can safely be recommended for more than one reason.

A brief description and requirements of these new varieties of wheat may, therefore, interest the hill farmers and the extension workers.

Ridley: This is an acclimatized Australian variety of wheat introduced by the Indian Agricultural Research Institute and selected after trials at the Wheat Breeding Substation, Simla. It has been tested at a number of hill stations in Himachal Pradesh and other places in the Union. It has been seen to possess a wide range of adaptability to soil and other environmental conditions. It has out-yielded the existing varieties of wheat in a majority of trials. Besides high yield, it possesses a high degree of resistance to rust as also to the loose smut disease.

Ridley is a hard, amber coloured and bold grained variety of wheat with smooth chaff and beardless heads. The plants are of medium height and stiff-strawed which make the variety resistant to lodging. These plant characters coupled with its good tillering capacity, dense ears and high test weight of grain, contribute to its high yield. Though medium late as regards earing period, it is a fairly early maturing variety of wheat.

A plot of Ridley wheat at Simla is being examined for purity by the breeder

It has been seen to respond favourably to earlier sowings too. Due to its high degree of resistance to black rust, it is also suited for cultivation in low altitude areas, where, this disease is more severe due to the higher temperature conditions prevailing at these places.

Though the present supplies of seed are limited, the Himachal Department of Agriculture is making every effort to make available large quantities of seed of this variety.

N. P. 770: This variety was bred by Dr. B. P. Pal from a cross between an Indian and a Japanese wheat. It has been tested for yield for a number of years both at Simla and at a number of places in Himachal. It has been seen to out-yield the local selections grown in this region. As previously mentioned these local varieties have been seen to be very highly susceptible to the rust and smut diseases. N. P. 770 under similar conditions has been seen to be highly resistant to the yellow rust and loose smut. At Simla, it has been seen to escape black rust which appears rather late in the wheat growing season and this variety has already ripened by that time.

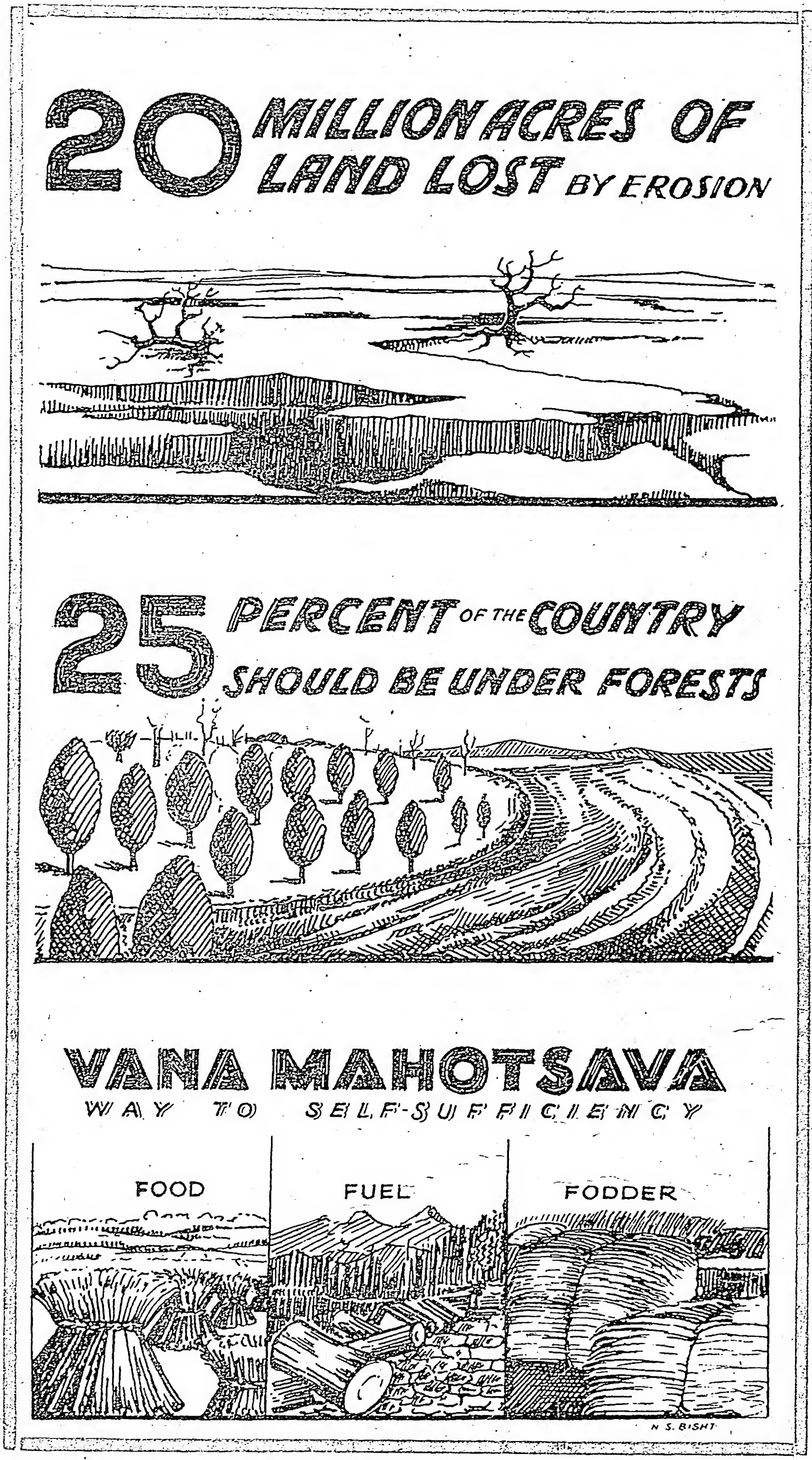
N. P. 770 is a hard, attractive and amber coloured wheat with hairy chaff and bearded ears. The latter assumes a drooping position and the awns turn somewhat darker in colour at maturity. The plants are tall growing and fairly stiff strawed to resist lodging. The high yield of the variety is due to its good tillering, vigorous growth, long ears and good test weight of grain. It is fairly early in maturity and does best when sown during the optimum sowing period. It does not respond well to very early sowings and at altitudes above 4,000 feet or so, sowings done after the first week of October have given bumper harvests. Its suitability to still lower altitudes is being investigated. Its early maturing habit and bearded characters make it particularly desirable for cultivation in areas where birds are a menace to the standing wheat crop.

The Himachal Department of Agriculture will now be in a position to meet the seed needs for this variety.

In view of the great need for improved varieties of wheat, it is hoped that all interested in the wheat cultivation work, both in Himachal and at other places in the Indian hills, will make the best use of the fruit of the much needed research.

N. P. 770 wheat in the variety plots at Simla

A NOTE ON VANA MAHOTSAVA



HARKIRAT SINGH

VANA Mahotsava—the Festival of Trees—is a programme of national reafforestation. It is one of the important national festivals and aims at making the public tree-conscious through public planting of trees by national leaders. It has assumed special significance in recent times due to widespread deforestation which has created desert conditions in large areas. In many parts of the country, lakhs of acres of land have lost their valuable topsoil by erosion caused by reckless destruction of trees. Erosion has eaten up the banks of most of our rivers causing floods in monsoon and water scarcity for the rest of the year. Indiscriminate cutting down of trees without a proper scheme for their regeneration has led to burning of cow-dung in the villages for want of fuel wood; our most valuable manure is thus being wasted away.

Trees give moisture to land, save land from erosion, give dry leaves for composts and rich fruits for food; they supply fuel for the villager. In addition, they impart beauty to their surroundings. It is, therefore, essential to plant more and more trees with a view to arresting the growth of expanding deserts, preventing large areas of land from being converted into waste by soil erosion, saving cow-dung for use as manure and augmenting food supplies of the country to avert famine.

The matter does not end there. Care of the trees planted is more important than even the planting of trees. Tree plantation has been enjoined as a sacred duty in Indian society and the task of preserving trees has been handed to us from time immemorial. Every single tree that is planted should be watered, preserved and protected. Nothing short of a comprehensive plan for the planting and preservation of trees would solve our difficulties of food, fodder and fuel.

MARKETING AND HANDLING OF COORG ORANGES

Orange Research Scheme, Coorg

COORG is famous for its orange (Mandari) which is an attractive loose-skinned fruit of fairly good size with a pleasant taste and agreeable flavour. The marketing of the fruit was conducted in an unsystematic and haphazard manner involving a great loss to the growers. A scheme known as 'Orange Marketing Scheme, Coorg' was, therefore, sanctioned by the Indian Council of Agricultural Research.

The scheme was intended to examine the marketing conditions and to explore ways and means of profitable transportation and storage of the oranges.

Experiments on the packing of oranges revealed that the keeping quality of the fruit transported in boxes and baskets was better than that of the fruit transported in loose condition. It was found that no damage was caused in the former case while the later involved a loss of a little over one per cent per lorry load of the fruit. The bamboo baskets also proved suitable for transport to distant places.

A Cooperative Fruit Marketing Society called the Coorg Orange Growers' Society was also organized during the period of working of the Scheme. The Scheme proved extremely helpful to the Coorg orange growers. The propaganda work carried out by the Society enlightened all orange growers on market rates, demand and supply position, market trends and other matters generally relating to the orange trade. The Society has its sale depots at Bangalore, Mysore, Mangalore and Tellicherry and possesses its own transport system.

Grading trials under AGMARK by hand grading showed that the sale of graded fruits wrapped in AGMARK tissue paper attracted a larger number of retail customers and fetched a better price than the ungraded oranges.

Experiments were also undertaken in cold storage of oranges. It was observed that the damage to the fruits in the cold storage at temperatures ranging between 39° F. to 43° F. for a period of 2½ months was about 15 per cent under conditions in which the experiment was undertaken. It was also noted that none of the fruit rotted within three days, that only 8.33 per cent rotted within four days and that 77.78 per cent of the fruit remained in good marketable condition even at the end of one week of their exposure to ordinary climate after their removal from cold storage. The experiments conducted in the laboratory of the Indian Institute of Food Technology, Mysore, conclusively proved that a squash of good quality could be prepared from the Coorg oranges. On the basis of this recommendation the Fruit Technologist of Coorg Government completed experiments on extraction and preservation of orange juice and other fruit products in his laboratory. The fruit products stood storage tests in Coorg and their quality was tested and well certified.

SEED POTATO DEVELOPMENT IN HIMACHAL

(*Continued from page 25*)

actually harvested in the hills. These States at present are, therefore, dependent mostly on Bihar for their seed stocks which are neither healthy nor cheap. Cold stores are, therefore, increasingly popular in the plains. Introduction and extension of cold storage facilities for preservation of seed potatoes is, at present, however, not likely to solve the problem of 'degeneration' of seed potatoes. Increased demands for Himachal seed potatoes is, therefore, assured if the difficulty arising out of the dormancy of tubers can be overcome.

There are three ways to overcome this difficulty. Firstly, we know of certain chemical treatments, which help to break the dormancy of tubers. Thus, treating the tuber with vapours of Carbon disulphide or Ethylene chlorhydrin breaks the dormancy and the tubers begin to sprout about a week or ten days after the treatment. Experiments are in progress at the Central Potato Research Institute to determine how far it is possible as commercial proposition, to undertake chemical treatment for breaking dormancy.

A second and a useful dodge of surmounting the difficulty arising out of dormancy of tubers is to utilize, as seed, the early grown potatoes harvested in July. In Himachal, at lower elevation of about 4,000 to 5,000 ft. above sea level potatoes are planted in January-February and harvested by July. This crop, as is the popular belief, cannot be used as seed for it has poor keeping quality and, therefore, is known as *kuccha* crop. With the use of the right type of varieties and proper cultural treatments experiments have shown that there is no reason why this crop cannot be stored for about two months in higher elevations and later sent out as seed to such tracts where the produce of main September harvest cannot be used as seed.

A third and at present most practicable method is to utilize the Himachal produce for second crop in the plains. Sown from November to January such crop is lifted by the end of March. The seed size tubers from the once grown produce in the plains can be preserved for main September planting next year. This method has much to recommend itself for several reasons. As an instance, *Delaware* is a variety which

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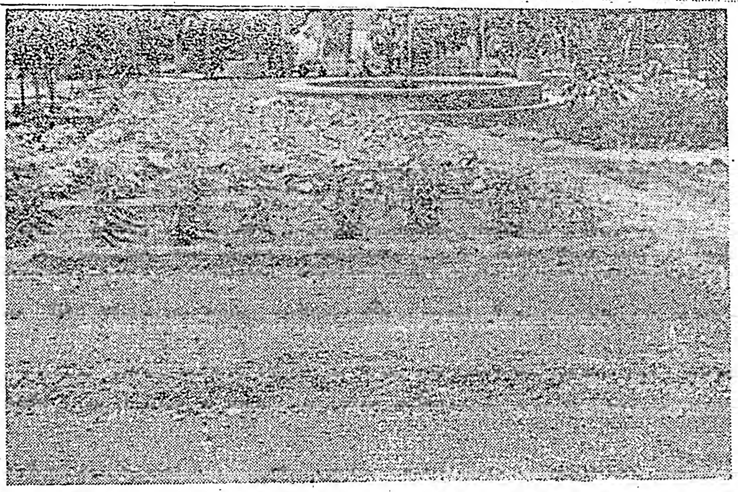
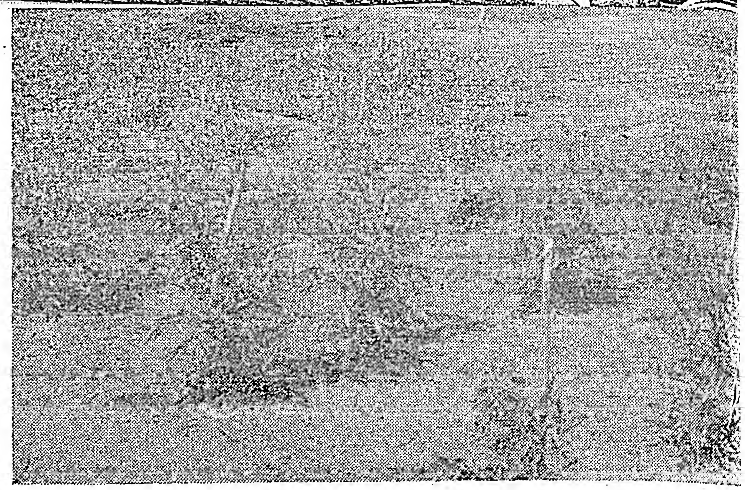


A vegetable kitchen garden (in the foreground)



A view of a kitchen garden

CITY FOLKS—GROW MORE FOOD

HUGH WALKER

THE city dwellers in Hyderabad have been given their share of responsibility in the "Grow More Food" programme and the kitchen gardens have become a regular weapon of great importance in the struggle for more production.

If you visit the home of the Ex-Chief Minister and the present Counsellor to the State Government Shri M. K. Vellodi and that of other top Government Officials, along with those of many average citizens, you will find laid out in a very neat form a real productive "Hyderabad Kitchen Garden"—a garden that has produced a year's supply of fresh vegetables for an average family.

The credit for this programme goes to Shri P. D. Nair, Director of Agriculture, hyderabad State and his horticultural staff who have prepared one of the most effective plans that you will find for the use of a small area for maximum food production anywhere. As a result of this practical approach, some 600 productive gardens of this type have come into existence in Hyderabad city within the past 18 months.

WHEN AND HOW TO GROW VEGETABLES

Sl. No.	Name	Method of sowing	Time of sowing	Distance between plants	Distance between Rows
1	Brinjal	Transplanted	June, July, December, March, April.	1½'	3'
2	Tomato	Do	Alround the year	2'	3'
3	Chillies (ordinary)..	Do	July, August, Dec.	1'	2'
4	Capsicum (Giant chillies)	Do	Do	1'	2'
5	Cabbage	Do	October, January	1'½	1½'
6	Cauliflower	Do	August, December	1½'	1½'
7	Knol Khol	Do	August to February	¾'	1½'
8	Lady's Finger ...	Dibbled in situ	Alround the year	1½'	2'
9	Cluster Beans	Do	Do	1½'	3'
10	Cowpea	Do	Do	1'	3'
11	French Beans	Do	June, July, Dec, January	1½'	1½'
12	Soya Beans	Do	Do	1½'	1½'
13	Peas	Do	August, Oct. January	6"	6"
14	Ribed Gourd	Do	July, December		
		4-5 seeds in pits (6-8 feet part) 2 × 2'			
15	Snake Gourd	Do			
16	Bottle gourd	Do			
17	Bitter gourd	Do			
18	Pumpkin	Do			
19	Ash Gourd	Do			
20	Dolichos Lablab (sem)	Do			
21	Cucumber	Do	February, March, May		
22	Squash	Do	June, July, Dec. January		
23	Greens (Baji)	Broadcast and thinly cover with soil	Alround the year	6"	6"
24	Palak (Indian Spinach)	Do	Do	6"	6"
25	Ambade (Gogu)	Do	Do	6"	6"
26	Lettuce	Transplanted	August, December	½'	1½'
27	Beet root	Dibbled	September, December	4"	1½'
28	Radish	Do	Alround the year	½'	1'
29	Carrot	Seeds mixed with fine sand and sown in rows	July to February	4"	1'
30	Turnip	Do	July, December	6"	1½'
31	Onion	Transplanted	Oct. July, Nov. March	½'	¾'

—x—

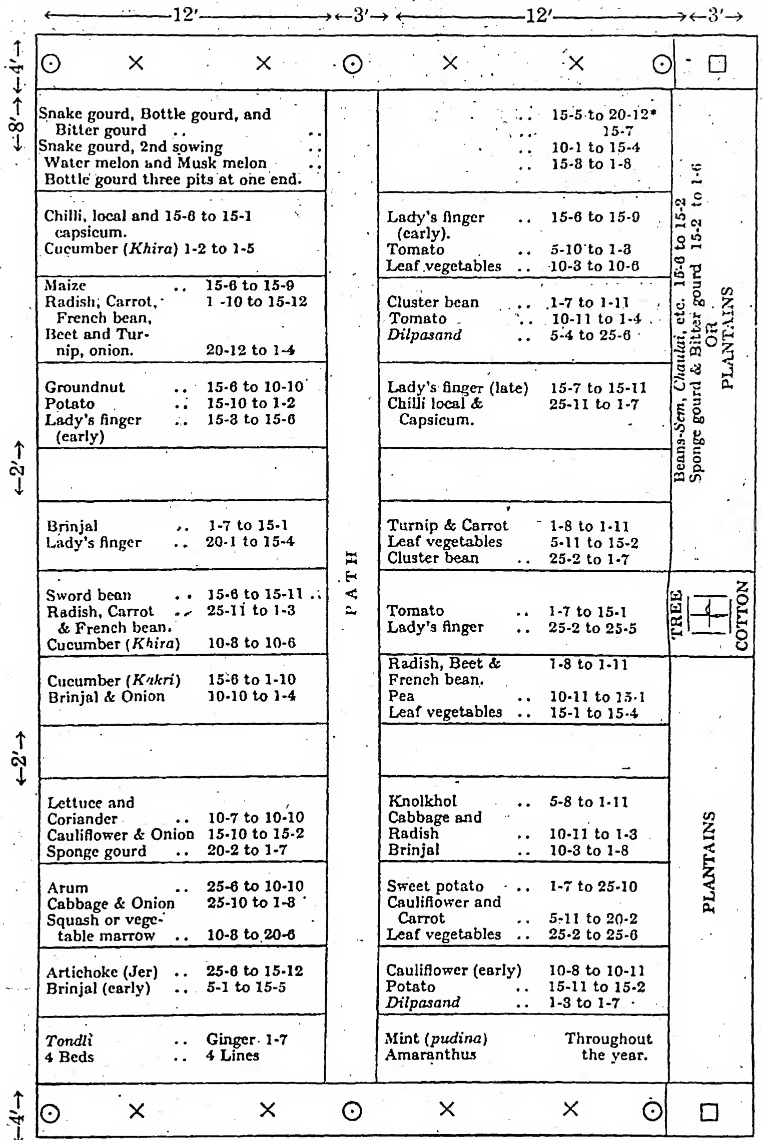
. The important feature of this type of garden is that it is planned in such a way that it gives maximum production on a minimum area and yet the supply of any one item of produce seldom is greater than that required by the family. It calls for small plots which may be replanted regularly and thus yield continuously rather than supplying of an enormous quantity of a particular vegetable at one time which cannot be utilized and thus becomes a waste.

The garden itself may vary in size or shape, but you will find all the space utilized in every instance around the edge of the garden where papayas, plantains, and climbing vegetables such as beans and gourds are planted. The remainder of the space is divided into small plots generally about 12ft. x 8ft.

To insure a ready and reliable supply of plants and seed, the Department of Agriculture has established a seed store and a nursery which has all kinds of seeds and seedlings required for an average garden along with a seasonal supply of healthy and vigorous plants that are ready to go into the gardens. This enables a person with a small area to utilize the entire amount of space for production rather than using some of it for seed bed or plant production.

These gardens are planned for family units and as such they are suitable for use of family-labour. It is not at all uncommon to find the entire family out-working in their kitchen gardens. And that is the way it was intended. If you and your family want to contribute to the "Grow More Food" programme you might grow a "Hyderabad Kitchen Garden".

PLAN OF HYDERABAD KITCHEN GARDEN



* The figures refer to approximate dates of sowing and final removal of crop.

⊙ PAPAYA. × GARDEN TUR. □ TAPIOCA.

MARKET NEWS SERVICE FOR FARMERS

(*Continued from page 12*)

true that the factors that have been responsible for the efficient operation of the Service in the U. S. A. are lacking in our country. However, a modest beginning can be made and service expanded and improved as conditions with regard to communications and other market facilities improve. Our farmers are illiterate and dissemination of market information through newspapers and bulletin boards may serve little purpose. The lack of radio communication in rural areas also makes it difficult to reach the farmer. Under the circumstances, therefore, the best thing would be to make arrangements for dissemination of market news gathered by an unbiased agency through the loud speakers in the market place every morning before the sales begin and also at the close of the market when farmers leave for their villages. This could be easily adopted at a very low cost in the village markets particularly in the States where regulated markets are functioning. The information given out in the morning should contain price quotations of the previous day of the local and the nearest distributing or terminal markets. In the evening, news of the day's quotation and other available information may be announced. The farmers on their return journey may help in the dissemination of reliable market news by word of mouth.

(*Continued from page 29*)

reacts favourably to high temperature and can be sown slightly early. It would mature within a short period of 50-60 days. In tracts like Biharshariff in the State of Bihar where cultivators specialize in growing 60-days *satha* for early market, *Delaware* is not only expected to give earlier crops than *satha* but yields much larger crop of good sized tubers. Here the difficulty in securing seed stocks can be overcome by annually importing stocks from Himachal for November planting and at harvest, in March next, preserving seed sized tubers for early planting next season.

GRADING, STANDARDIZATION AND MARKETING

Grading and standardization of the produce helps to sell the goods on the basis of their description and is one of the important principles of modern commerce. It induces confidence among the buyers and thus assures good markets.

Apart from the purely commercial aspects, grading and standardization is also necessary if the potatoes are offered for sale as seed, for it is not all sizes that would be economical for seed purposes. The requirements of different tracts are also different. In some places seasonal conditions would not permit cut tubers to be planted and here small sized whole tubers are preferred as seed. Again, in certain areas, as in Bombay, it has been found profitable to cut the tubers and the most economical size is a tuber weighing about four to six ounces which will, on cutting, yield four solid seed pieces. Keeping the above factors in view it is necessary to grade the potatoes according to some recognized and definite standards which aim at satisfying varying needs of buyers.

Hitherto in Himachal three commercial grades (Lambri, Phool and Rashan) based on size of tubers are loosely recognized by the trade. No specifications of standards are adopted by the trade to eliminate dust, dirt, damaged or otherwise diseased tubers from any of the above grades. In fact, no bag of tubers may be seen which does not contain besides lot of dirt and dust, a high percentage of diseased or damaged tubers. No regard is paid to the variety or freedom from disease.

Under the scheme the grower will be expected to grade stocks in accordance with the standards laid down by the Department and carry his produce and certificate of health and purity to the assembling centres of the cooperative societies. If the grades conform to the standards of the stocks at the assembling centres, it is the intention to pack the produce in special gunny bags, each bag displaying on it the name of variety, the grade of potato and the year of certification.

The success of the scheme to a large measure, is due to the great and personal interest which the officers of the Himachal Potato Development Scheme have taken and I am highly grateful to them.

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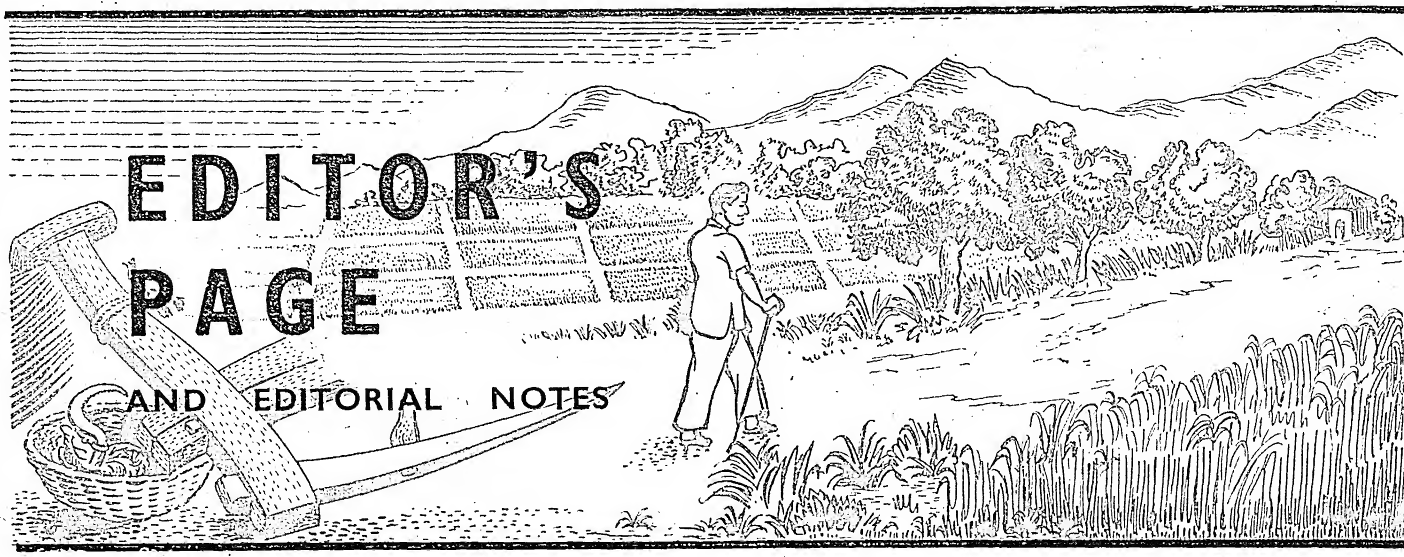


GOALS: PEOPLE AND PRODUCTION

Nothing will be achieved by discussing the relative importance of essential objectives in village development work. It is enough that the objectives are essential, and must, therefore, be pursued. There is some danger, however, that the urgent goal of increased farm production will cause us to neglect the equally urgent need for the development of leadership among producers.

Fortunately, leadership training can be a painless by-product of any community improvement effort. Yet it is important that extension workers are reminded that leadership development is one of the main products of their efforts.

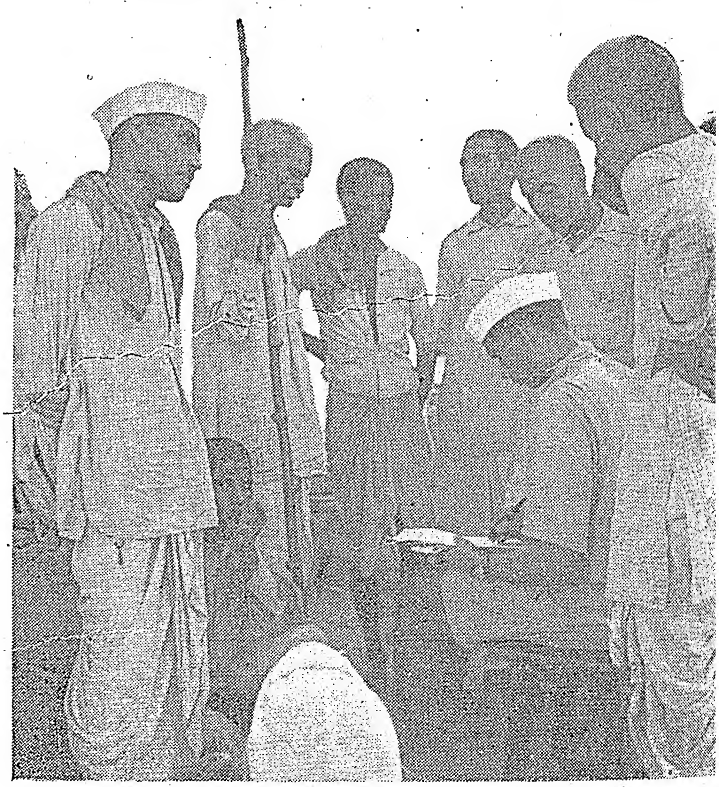
It has been agreed by all in community development work that villagers must be helped to help themselves. It has been agreed that simply giving villagers instruction will have no enduring benefits.

When villagers help themselves, they must assume responsibility for group action. Assuming this responsibility is an elementary leadership activity. Discharging the responsibility is a demonstration of real leadership.

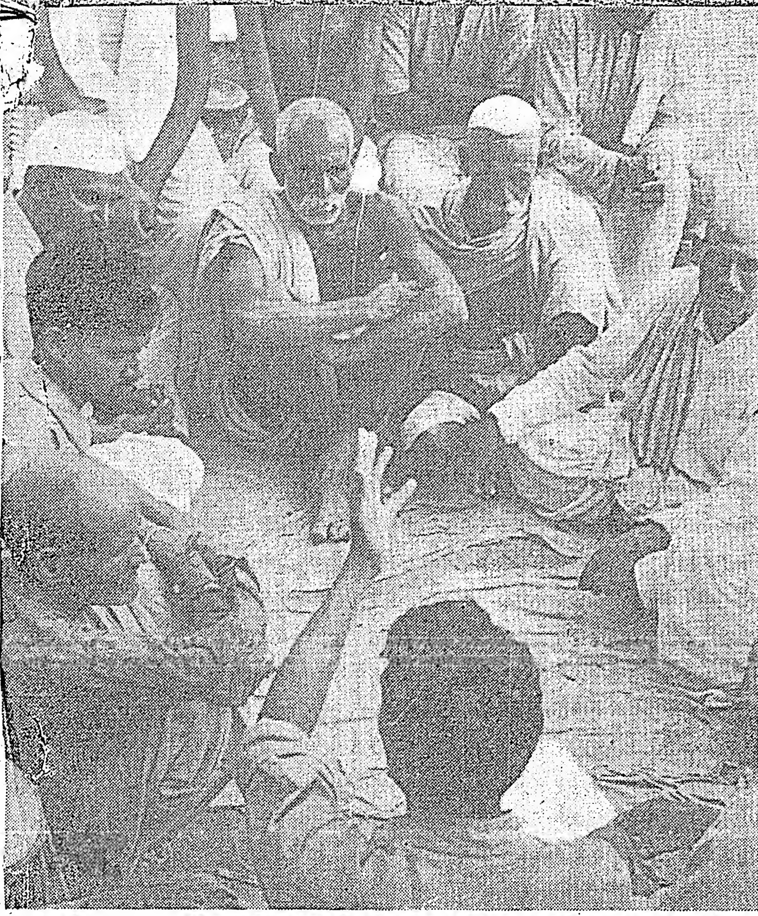
How are villagers trained to assume responsibility for group action? In order for a leader to develop leadership he must be satisfied to allow others to assume important responsibilities, and must be satisfied to see others receive credit for work which he himself could have done.

REDUCING RESISTANCE

From the very first approach to the village the extension worker must be determined to stimulate action by the villagers and to stimulate certain villagers to assume the leadership for this action. Experience has shown that the most difficult job in developing leadership is breaking down the first resistance to responsibility. Once this first resistance is removed, local people with leadership abilities will spring up surprisingly fast.



"They have made the decision on their own"



"People with leadership ability will spring up..."

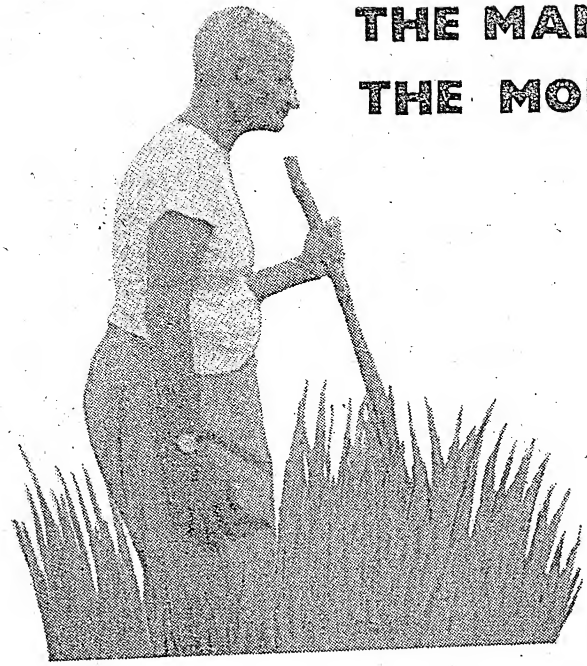
How is resistance to leadership responsibilities broken? There are many answers to this question; but in general the village worker must seek problems for village solution which groups in the village are genuinely interested in solving. Suppose he finds, for example, that the villagers believe that one of their biggest problems is the difficulty with which water is lifted from the village well. The village worker does not say to the villagers that they have other problems more important which need attention. He accepts this decision of the villagers and immediately begins a programme for stimulating group solution to the problem.

PATIENCE NEEDED

The extension worker does not do the easy thing and dictate answers. Rather, he depends upon the villagers themselves to find the answer. He encourages everybody to offer their solution. When, for example, it may be generally agreed that a new rope and a pulley should be bought and installed over the well, the extension worker accepts this decision if the majority of those he is working with sincerely believe it is the right answer. He is performing one of the first steps in developing leadership; in helping villagers to help themselves. They have made the decision on their own. His next step is to get them to act upon this decision. Money must be obtained for buying the rope and the pulley. The easy way will be for the extension worker to collect this money himself. The easy way seldom develops leadership.

The village worker must be patient, for these first efforts will be slow. But as soon as some of the members

(*Continued on page 32*)



THE MAN OF THE MONTH

BISHAN MANSINGH OF FATEHPUR STILL YOUNG AT SIXTY-ONE!

THERE are three towns of Fatehpur in India, but there is only one Bishan Mansingh of Fatehpur who is one of the outstanding farmers of India. Mansingh's Fatehpur lies on the Delhi-Calcutta line between Kanpur and Allahabad on the Eastern Railway.

A graduate in history, Bishan Mansingh's experience of practical agriculture extends to nearly 40 years. Still young at 61, his views command respect not only in the councils of his home state of Uttar Pradesh, but even in the Central Government. He is a member of the Panel of Agriculture of the Planning Commission and of the Board of Agriculture, Uttar Pradesh Government. There isn't a subject connected with agriculture in India on which Bishan Mansingh hasn't something useful to say based on his own experience, nor are there many agricultural matters on which he hasn't contributed articles to the press. He has taken many agricultural problems in his stride, soil erosion, agricultural implements, the rotation and water requirements of crops, forestry and land reclamation; there is probably hardly any other farmer in the country with a more intimate knowledge of the organisation of agricultural departments in India.

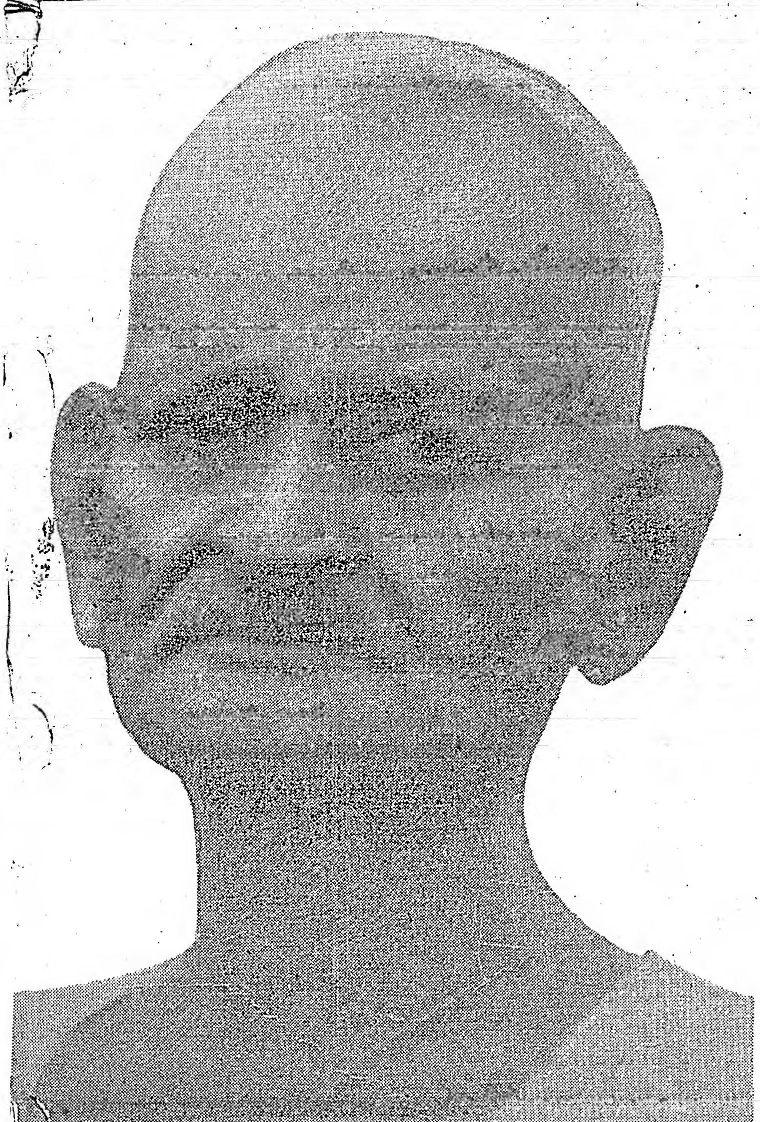
PIONEER IN USAR RECLAMATION

I met this remarkable farmer in his home town last September. Bishan Mansingh received me at the railway station, and as we drove in his car to his small house about five miles away, he kept up a running commentary on his farms, the years of hard work he had put in, and the returns that he had got not only in terms of money, but what was incalculable, in the experiences he had gained. This latter he is keen to pass on to other agriculturists "faced with problems similar to mine." Running through all his talk, was one dominant note, of gratitude to his father who was a pioneer in the work of reclaiming *usar* land.

Usar land, as found in Uttar Pradesh, is unproductive land, made up of deep layers of stiff, heavy, poorly aerated clay, devoid of all humus and containing large amounts of salts which are injurious to all kinds of vegetation.

It was in the late nineties of the last century, Bishan Mansingh, explained to me, that his father the late Ishwar Sahai started cattle breeding on his Habeeb Farm. Soon he was up against the need for cheap fodder and a grazing ground for his herd. For this he turned to a fairly large plot of *usar* land in his village. The land was surrounded with low embankments, designed more to demarcate the area, but they also served to hold rain water which helped to wash away the injurious salts from the soil. Gradually perennial weeds like *kans* began to appear and their growth was encouraged; at the same time grazing was regulated so that the grasses might thrive and the fodder made to last longer. Seeds of *bābul* were sown during the rains year after year; despite heavy mortalities, the practice was continued, till in about 10 years, a good *babul* plantation had come up with a luxuriant undergrowth of grasses of various kinds and perennial weeds. These opened up the soil.

In 1916, the young college graduate, Bishan Mansingh, who had till then watched his father at reclamation work, with interest, literally "took off his



coat" and took to agriculture with a zest which has not dimmed despite the passage of years and which might put many a younger man to shame. When Bishan Mansingh talks of his farms, his deep sunken eyes sparkle with delight; when he shows them round to visitors he walks as one possessed.

EARLY YEARS

Mansingh recounted to me, as we breakfasted together, the early years of his spartan training in agriculture under his father. Mansingh was enamoured of a government career—a Deputy Superintendentship of Police or a Deputy Collectorship was his for the asking—but old Ishwar Sahai willed that his son should take up agriculture, where if he worked hard, he would be "better off than any deputy collector." The father's will was law, and Mansingh started his life as an agriculturist with no capital but a few bull calves, and some *babul* trees planted on unproductive *usar* land.

Workers engaged in a silage pit. The hay will be dug out when fodder gets scarce

Mansingh breeds cattle too. A portion of his herd

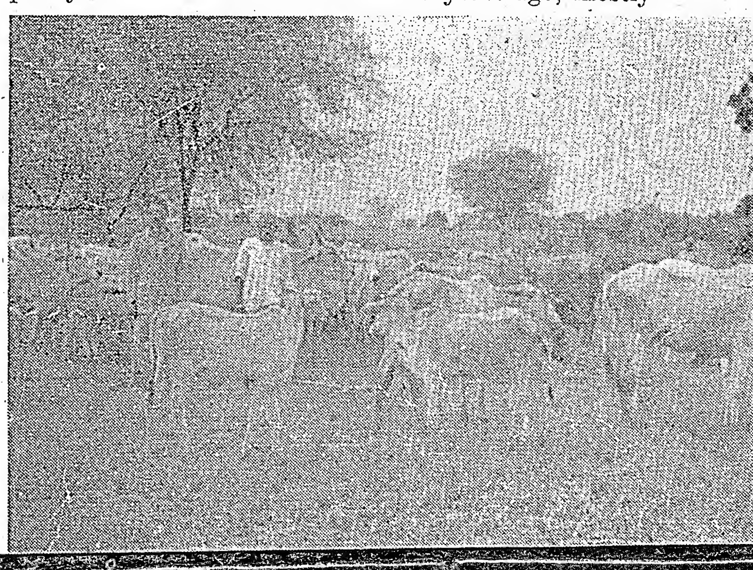
Every drop of water is conserved on the farm. Rain water stored is being used to irrigate a paddy field

Dogged determination and hard work soon yielded results, and in a few years Mansingh had sold his *babul* trees for Rs. 5,000. After this there was no turning back. Today if he takes pride in his Bilanda and Habeeb farms, there is justification for it. *Usar* land, barren and certified as unfit for cultivation is today green with growing paddy crops; areas which were infested by kans decades ago, today bear a fruit orchard, whose guavas, mangoes and lime are among the best in the district.

Bishan Mansingh has blazed the trail for many an agriculturist. He is perhaps the first to grow paddy on land reclaimed from kans, and has shown by his example that it is possible to cultivate paddy on pebbly soil (*bajri*, *kankar* soil) or grow indigenous fodder grasses, provided the rainfall is adequate and the land remains under water for a fairly long period. Today, thanks to the pioneering effort of Bishan Mansingh, miles of once *usar* land on both sides of the Grand Trunk Road are covered with paddy fields. When the farmers of the district saw that *usar* lands could be reclaimed by methods within their means, they needed no further persuasion in reclaiming the land for paddy cultivation.

BILANDA FARM

The 340-acres Bilanda Farm owned jointly by five brothers is managed by Bishan Mansingh. It is an excellent example of intensive farming; it shows what can be achieved by persistent, untiring effort even on the most unpromising soil. The land which now grows paddy and fruit trees was about 40 years ago, mostly



barren *usar*. How has the miracle been achieved? Bishan Mansingh relates with justifiable pride that his methods can be copied even by the poorest of Indian farmers. As one walks round the farm, one is struck by the method of conserving almost every single drop of rain water. Tanks have been constructed to catch all rain water, a run off for surplus water entering the farm from higher areas has been provided, and the *usar* fields have been developed by building *bundhis* or low embankments about a foot high round well laid-out fields. In some parts, I could see, as the rain came down in blinding sheets, water of the whole village flowing into Mansingh's farm. It was being caught in artificial tanks, and would later be used to irrigate his crops. Another remarkable feature of the farm was the roads which crisscrossed it; despite the heavy rain which dogged us that whole day, I had no difficulty in moving into any corner of the farm that I wished to see.

FOREST IN FARM

A little less than one-third of the farm is under cultivation. "There is not enough water to irrigate

Land which was barren now grows paddy. In the background is the fruit orchard

more" Bishan Mansingh told me, but he was not despondent. "Forestry is a passion with me" he said with the light of challenge in his eyes, "that is why I have brought forests into my farm." The trees that he has grown are a gold mine to the family. Ten acres are under guavas, nearly 6 under mangoes and 2 grow jack fruit. He has 50 mahua trees, 200 of lemon, 300 plum trees of improved variety, 1,000 shisham trees, 2,000 neem, 4,000 *ber* trees and he has no count of his *babul* trees. He is experimenting with growing teak; I saw two trees which seemed to be coming up well.

There is enough grazing on the farm for a fairly large herd of oxen and buffaloes. They provide the motive power for agricultural operations and the manure for the fields. Bishan Mansingh is no wild enthusiast of chemical fertilisers; he uses them, but in moderation. Typical of his approach to "modern methods of agriculture" is the reply he gave to an agricultural expert who asked him if he practised scientific agriculture. Said Mansingh, "Yes, in the sense that no agriculture can be scientific which fails to count the cost of production!" Further conversation, I gather, would have been somewhat difficult between the "expert" and the farmer of Fatehpur. In years of a normal and well-distributed rainfall, he has raised up to 30 maunds of rice an acre on his fields and occasionally 50 maunds! Some of the villagers in the area, he told me, could raise only 4 maunds an acre.

HABEEB FARM

A 100-acre land called Habeeb Farm is Bishan Mansingh's exclusive property. About 30 acres are under paddy and the rest is grown with fruit trees or is forest. The methods of conserving water, and cultivation are the same which Mansingh has practised with such outstanding success on the joint-family Bilanda farm. Where rice is intended to be grown, the field is enclosed by embankments to hold all rain water; not a drop of which is allowed to escape. Next year it is protected from grazing and sown with leguminous crops. In the third year rice is grown after the land has been fertilised by large quantities of farmyard manure.

The fruit orchard in this farm yields more profit than the rest of the Habeeb Farm. I was not surprised, for I saw the rain-washed lime and guava trees bending with the burden of their thickly studded fruits. The season was still early, and as I saw the oranges, the lemons and the pummaloes, I realised that I had entered a treasure trove. And to think that once the area was unproductive *usar* land.

MANSINGH THE MAN

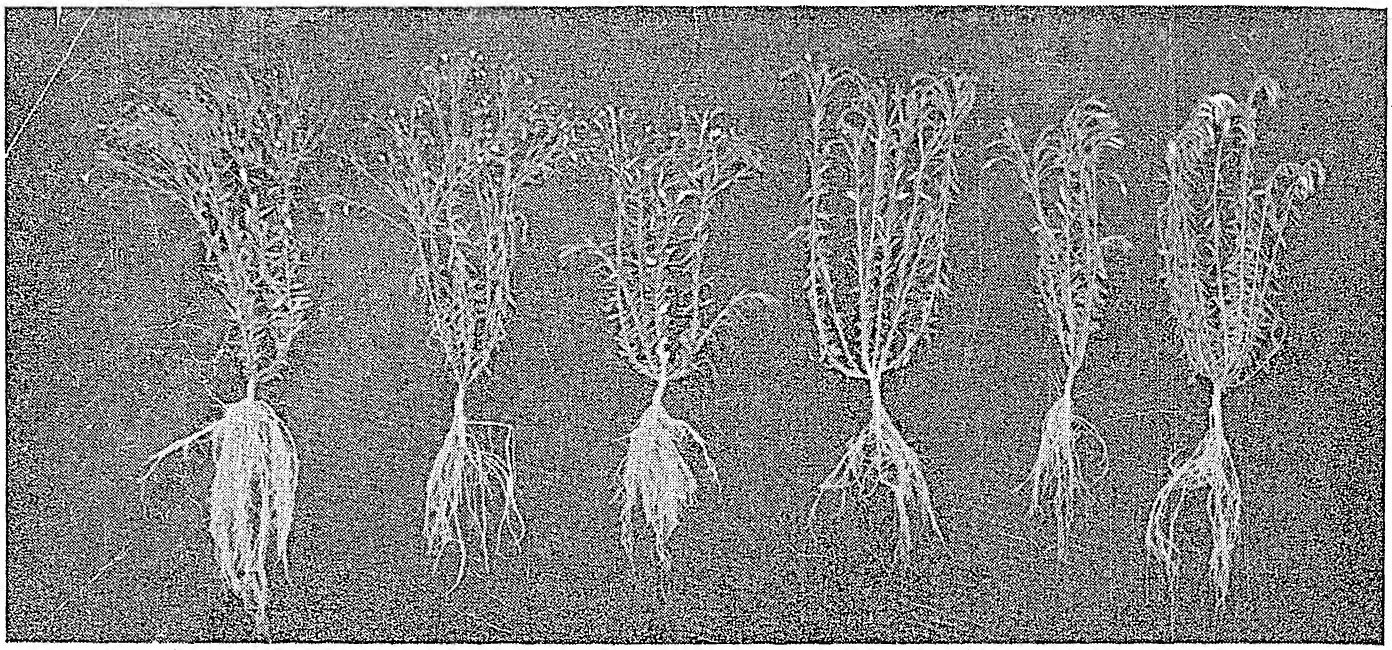
I was interested not only in Bishan Mansingh's methods but also in the man himself. To me he appeared to be an expert agriculturist with a thorough understanding of the principles of successful agriculture. These he has studied not only in the fields on which he works for hours, but also from the various reports and journals on agriculture which adorn his bookshelf. He is a voracious reader of agricultural books, and the heavy markings in red pencil found in their pages, tell their own tale. Mansingh is a great experimenter. Whenever an idea occurs to him, whether on his field or at his desk, out comes a little notebook which is his constant companion. In its pages are jotted down memoranda which are later given a "field trial." I shall relate here only one such experiment. Nearly 15 years ago he noticed one of his favourite mango tree, languishing. It hadn't fruited for two years, and all indications were that its end was near. Bishan Mansingh tried improved aeration, of which he had read somewhere. The ground below the 75 feet diameter of the tree was cleared of all vegetation, and a circular trench was dug under the outer edge of branches. This was filled up to a depth of 3 inches with the droppings of cattle. miracle happened; fruits began to appear again and a precious tree was saved.

THE 10 COMMANDMENTS

Bishan Mansingh was a cricketer in his college days. He was perhaps the first instance of the cricket captain of a college taking his B.A. degree in the first attempt!

(*Continued on page 32*)


Active hands get dirty...
and where there's dirt there's Danger from germs!
Wash often with
LIFEBUOY SOAP
it protects you from the germs in dirt!
LIFEBUOY
SOAP
LIFEBUOY SOAP
L. 113-193



Rust resistant strains of linseed—R.R. 10 (1), R.R. 191 (2), R.R. 193 (3), R.R. 197 (4), R.R. 208(5) and R.R. 236 (6). The rust-resistant strains R.R. 197 and R.R. 236 have mid-season maturity, good primary branching and give high out-turn of seed

Hints to the Farmer: OILSEEDS

By **P. C. RAHEJA**

OILSEEDS are important rotation crops on all types of soils. They require less water and very little manure. Their success depends upon the cultivation given to the soil and their sequence in the rotation. The important *kharif* oilseeds are castor, groundnut and sesamum. All these are sown with the break of monsoon and subsist to fruition on the monsoon. Castor harvested in spring continues to grow on the conserved moisture. *Rabi* oilseeds are *sarson* (*Brassica Campestris*), *rai* (*Brassica juncea*), *taramira* (*Eruca Sativa*), *toria* (*Brassica napus* var. Dichotoma) and linseed. These are normally sown at the close of monsoon and generally mature without irrigation.

SOILS

Oilseeds can be successfully cultivated on all varieties of soils. In Indo-Gangetic alluvium *rabi* oilseeds are more commonly grown while in the black and red soils of the South *kharif* oilseeds are more generally cultivated. Oilseeds usually do not flourish on acidic or very alkaline soils. They cannot stand very wet soil conditions.

PREPARATORY TILLAGE

A fine seed bed is required for all these crops. Six to eight cultivations are commonly given to prepare the fields. In cloddy fields germination of particularly small seeded oilseeds suffers and their stand is usually poor. Land is brought into very good tilth to have a firm seed bed without any weeds.

SEED RATE AND SOWING

Sarson, *rai*, *toria*, *taramira*, sesamum and linseed are mostly grown broadcast. Oilseeds have given good results when sown in rows.

Name of oilseed	Sowing time	Seed rate in lb./acre	Distance between rows (inches)
Sarson	Oct-Nov.	4-5 lb.	8–10″
Rai	do.	4–5 lb.	do.
Taramira	do.	4–5 lb.	do.
Toria	Sept-Oct.	4–5 lb.	do.
Sesamum	June-July Feb.-March (South India only)	2–4 lb.	12–15″
Groundnut ..	June-July	30–40 lb.	do.
Castor	do.	10–12 lb.	36–42″

The seeds of *sarson, rai, taramira, toria* and sesamum are never covered with more than 1 in. of soil. Groundnut kernels are dibbled $2\frac{1}{2}$—3 ins. deep so that seed is in contact with moist soil. Castor seeds are dibbled at 30—36 ins. apart in rows, two seeds being placed at a depth of 3—4 ins. below the surface of the soil. Sesamum crop after germination is usually thinned out to allow 15—18 ins. space between the plants for full development.

WEED AND INTERCULTIVATION

Sowing in lines facilitates these operations. Removal of weeds materially increases the yield of these crops in greater availability of soil moisture and nutrients. Small bladed *bhakhar* is usually run in between the rows to economise in labour. For working in between the castor rows five-tined horse hoe is a very suitable implement to cover the ground quickly and repeat the operation several times. Closely spaced oilseeds require 1 or 2 weedings or *bhakharing*. Castor

and groundnut crops require anything from 3 to 6 hoeings and weedings.

MANURING

When it is intended to grow castor as a cash crop about 10-15 cartloads of manure are applied to an acre particularly in the case of perennial varieties. Groundnut is another crop which is manured and about 5-6 cartloads of F.Y.M. are given. If it is not available a mixture of 1-1/3 md. of ammonium sulphate and 1-1/3 md. of superphosphate are applied as top dressing. It is better to drill the mixture 2½ ins. below the seed or dibble it in the interspace between the plants in the rows. Other oilseeds seldom receive any manure, for, they are treated as catch crops.

VARIETIES

In earlier issues of *Indian Farming*, improved types of groundnut, *sarson* & rape, linseed, sesamum & castor have been given in detail. But recently some experimental work on rust resistant strains of linseed has been in progress at the Indian Agricultural Research Institute, New Delhi. Types R. R. 197, and 236 have out-yielded the previous standard variety N. P. 21. They have also high oil content. They are practically immune to incidence of rust.

ROTATIONS

Wheat-*toria*-cotton-*senji* is the chief rotation in the Punjab. In some tracts maize replaces cotton. In most of the Uttar Pradesh and Bihar *sarson*, *rai* and *taramira* follow wheat in the next season. Usually they are mixed cropped with wheat. In southern India also they are grown mixed cropped with wheat or barley. Sesamum in northern India is sown in the rotation, wheat-maize (*senji*)—cotton+sesamum. In southern India it follows *ragi*, black gram or fodder crop. It precedes paddy on rice fields. Linseed is usually followed by maize, *jowar* or *bajra*. The commonest rotation is, linseed-*jowar*-gram. On rich land the common rotation followed is linseed-maize-wheat. In this rotation maize is manured with 5-10 tons of compost. Castor is usually sown as mixed cropped in *bajra* in separate-rows. Perennial castor is followed by groundnut and cotton.

HARVESTING AND PROCESSING FOR MARKET

In the *brassica* oilseeds the pods on the stalk get ready in 3-4 weeks after the start of the flowering when the crops are harvested. They are left in the field in sheaves for a day or two when they are carted to the threshing floor. The crop is trampled under bullocks' hoofs and separated seeds are winnowed out. Harvesting of sesamum starts when capsules have palish tinge, that is quite sometimes, before the capsules burst. The harvested crop is stocked in circular heaps upside down. The capsules dry up within a week and burst open. The plants are shaken and also beaten to complete emptying of capsules.

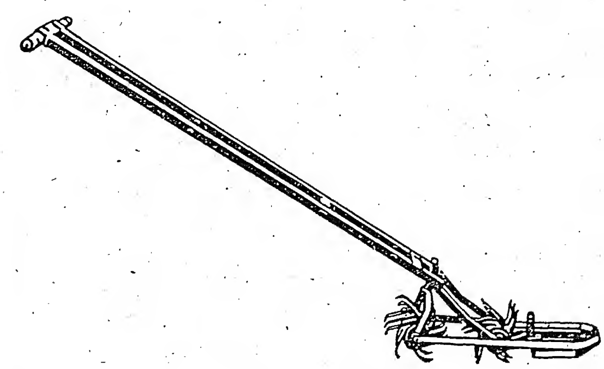
The groundnut pea pods are dug out with hooks or spades. The pods are separated by hand. In heavy black soil *sangli-kunte*, is employed to uproot peanuts which are gathered and stocked. The pods are combed out with a comb like rake. The process is facilitated after drying.

In castor all capsules do not ripen at one time. Capsules are, therefore, picked at short intervals. The pods remain in stock until their skin blackens. The seeds are beaten out with sticks.

RICE LAND WEEDERS FROM JAPAN

R. V. RAMIAH

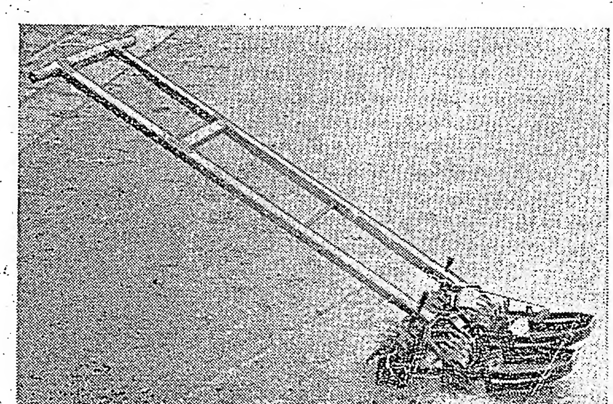
Head of the Division of Agricultural Engineering, Indian Agricultural Research Institute, New Delhi.



Japanese single row rice land weeder

One single row and 4 double row manually operated rice land weeders were received from Japan for experimental purposes.

The two row weeder was tried at Pusa, Bihar, in the rice fields which had been transplanted earlier with 12 ins. apart between rows. The weeder is designed to work for row widths of 9 ins. and above. The weeder worked successfully in fields with standing water of 1 in. to 2 ins. depth and it removed all the weeds without injuring the rice plant. In rice land where the moisture content was less than 20%, its operation was not good. The machine worked in a field of 1/25 acre in area. It takes 5 hours to weed one acre of rice land where the plants are in rows. Continuous operation for more than an hour by a man is possible. The work with this machine is less strenuous than by present Khurpi and its output is also more. Planting rice in rows, is however, a prerequisite for the use of these machines. The machines may be used in jute fields also if the seeds are sown in rows.



Japanese two row rice land weeder

Dr. Kalamkar, Director of Agriculture, Government of Madhya Pradesh, explained the quality of the soil, during the course of inspection of the farm

SINDEWAHI IS ON THE MAP AGAIN

SINDEWAHI in Chanda district of Madhya Pradesh is known to the readers of *Indian Farming*. We featured Nama Patil, a local farmer as its Man of the Month in November, 1951. On the 16th June, 1952 Sindewahi appeared on the map again marking a beginning of a new stage in the rural reconstruction programme in Madhya Pradesh. The first training centre under the Community Projects scheme was brought into being there.

Shri S. N. Mehta, Development Commissioner of Madhya Pradesh launched this centre in the presence of the first batch of trainees from the different States and agriculturists from the surrounding villages who were present in large numbers along with the Pt. 4 experts in the area.

This training-cum-development project is divided into two parts: 1 training centre and 2 development project.

TRAINING CENTRE

At the training centre advanced training is to be given to persons who have already completed technical, agricultural or public health training so that they may be oriented away from the desk to the field with a practical understanding of the techniques of "Demonstration" by doing. The practical aspects of agriculture, animal husbandry, public health, sanitary, veterinary and adult education will be particularly dealt with. The object behind the training is to start Agricultural Extension Projects with the help of personnel trained at this place.

The training centre has so far admitted 40 students including 20 from the States. These include 20 from Madhya Pradesh, 3 from Madhya Bharat, 5 from Bombay, 4 from Vindhya Pradesh, 8 from Bhopal. The period of training is extended to six months. Mr. Creech, an American expert, is to act as Adviser on the teaching side and Mr. Bell as Adviser on the development side.

SINDEWAHI DEVELOPMENT BLOCK

This block consists of 105 villages and has an area of about 150 square miles. A preliminary survey of the villages has been carried out. The survey was undertaken to ascertain (1) the problems of these villages (2) the possibilities of various land development and other schemes being introduced into these areas and (3) possibilities of taking up small irrigation works, etc.

Practically the whole of the staff required for the training and development programme for the centre has been posted to their places. The Public Works Depart-

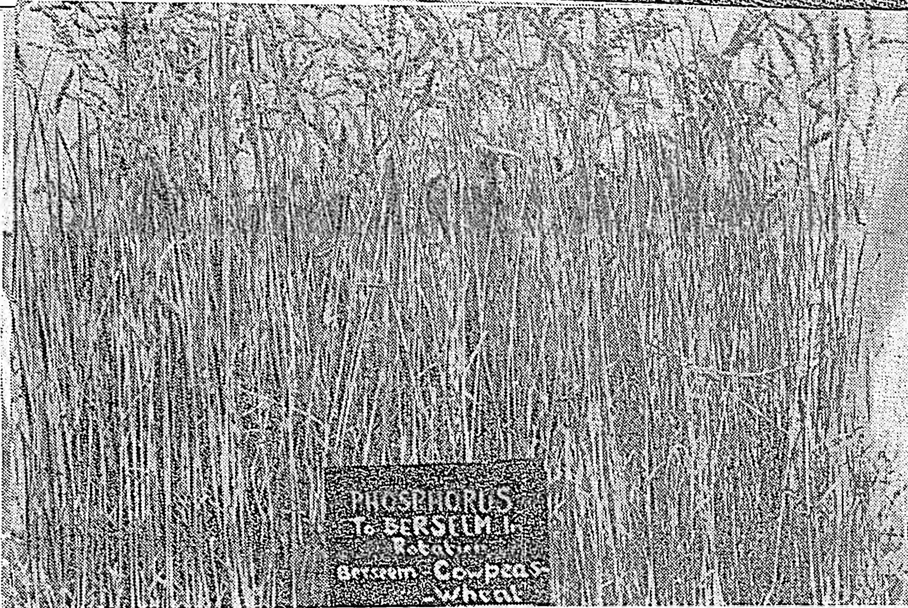
Mr. Bell Point-4-Adviser on Development side, watching the field operations conducted by the trainees

ment has already taken up repairs and alterations to the buildings.

The students are divided into five groups of 8 each for all village units and practical demonstrations. The all round development scheme of a 105 village block around Sindewahi will give these student trainees a lot to do. The farmer in India requires to be convinced of any new ideas before he goes whole-heartedly for it. Although considered to be conservative, the farmer is essentially progressive. His progress being dependent upon the type of guidance he receives and its appeal to his shrewdness. The Community Projects are meant to meet this demand and the confidence created by it will leave the onus on the farmer of availing himself of all possible help from the village level worker.

The Madhya Pradesh Government has taken a number of measures for the development of the State and towards raising the standard of living. Among these are the Khaparkheda power house, the agricultural college, and the engineering college. However, the need to coordinate the services rendered by such measures was felt by the authorities and the conclusion was reached that the village and the agriculturists in the village should be targets of all development schemes. Thus it was that the Community Project scheme launched through the Planning Commission has come to the rescue and Sindewahi marks the beginning of the onward march of Madhya Pradesh towards its cherished goal. In the words of Mr. Kelly, Agricultural Extension Supervisor of Government of India "The whole programme is of work, of action, of putting technical knowledge together and getting the results, and if we did it there, you can do it here."

The trainees are busy with the preliminary operations in the field



Wheat after berseem manured with phosphate.

LEGUMES AND THE SOIL

By **C. N. ACHARYA,**
Indian Agricultural Research Institute
New Delhi

THE use of legume crops as green manures, e.g. sann-hemp, *dhaincha*, *guar* and pillipesera, or as crops in the rotation, e.g. pulses, cowpeas, groundnut, soyabean, etc. is an old agricultural practice that has been prevalent in China and elsewhere for several thousands of years. It has been generally recognized that both as green manures and as crops in the rotation, they help to improve the soil and to maintain crop yields at a high level. Science has made considerable progress in explaining the reasons for the above beneficial effects of growing legumes, but there are still several gaps in our knowledge of the subject.

It was Hellriegel and Wilfarth (1886) who showed that legume crops carry in their root concretions, called nodules, billions of bacteria, which possessed the property of fixing nitrogen from the air. Beijerinck (1888) actually isolated the bacterium and called it *Bacillus radicicola*. Further work showed that there were different strains of the bacteria, which showed specific affinity for certain plants only and refused to grow on the roots of other plants. Thus there are strains which would infect only :—(*a*) lucerne and sweet clover ; (*b*) pea and vetch ; (*c*) soyabean ; (*d*) lupin and serradella ; (*e*) phaseolus ; and (*f*) others like cowpeas, groundnut, lespedeza, etc.

The activity of the bacteria in fixing nitrogen from the air depends on a number of factors including the nature of the host plant and soil conditions like the presence of lime, phosphorus and trace elements such as boron and molybdenum. Under favourable soil conditions, the nature of the host plant markedly determines the quantity of nitrogen fixed from the air; and the quantity so fixed may vary from 50 to 200 lb. nitrogen per acre.

Wheat directly manured with phosphate

The experimental data relating to green manure crops have been well summarized in a bulletin on the subject recently published by the Indian Council of Agricultural Research.* The quantity of nitrogen fixed by ordinary green manure crops like sann-hemp, *dhaincha* and *guar* may average about 50 to 100 lb. per acre and to this extent the succeeding crop is benefited when the green manure crop is ploughed into the soil. For obtaining the full benefit of green manuring, it is necessary that :—(*a*) the green manure crop should be still succulent, i.e. it should not have become fibrous ; (*b*) a period of 6 to 8 weeks should elapse between the ploughing in of the green matter and sowing of the next crop, in order to allow time for proper decomposition and nitrification of the green manure ; and (*c*) there should be adequate moisture supply in the soil either by rainfall or by irrigation, in order to provide for the moisture requirements of the decomposing green manure, as well as of the next crop grown.

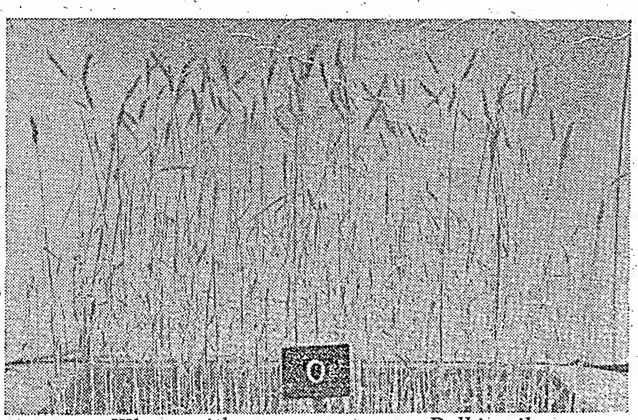
In the case of legume crops grown in the rotation for their agricultural produce, e.g. pulses, cowpeas, groundnut or soyabeans, the degree of beneficial effect on the succeeding crop depends again on the nature of the soil and the legume grown. Thus, it is known that a heavy yielding crop of groundnut or soyabeans may actually remove in the produce more nitrogen than what has been fixed from the air, and to this extent the soil may get impoverished in nitrogen, instead of being benefited. Pulses and cowpeas do not, in general, impoverish the soil to a similar extent, but may leave it in a condition of *status quo*.

Work carried out at the Indian Agricultural Research Institute, New Delhi, has shown that there are certain legume crops such as berseem, which possess intensive growth powers and help their nodule bacteria to fix large quantities of nitrogen from the air, which are sufficient not only to meet the growth requirements of the crop, but also to leave an excess in the soil, which helps to improve the fertility level of the soil from year

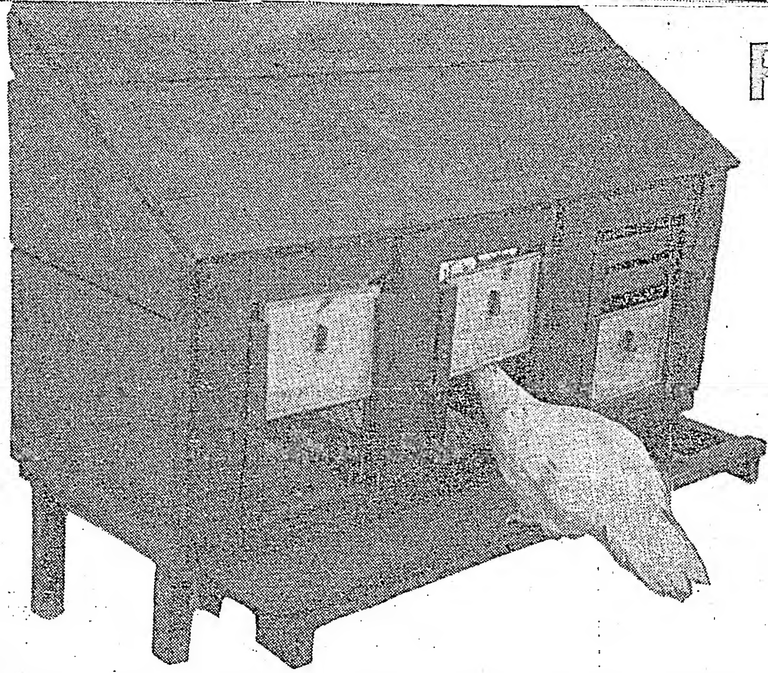
*Review on "Green Manuring Practices in India" by B. K. Mukherji and R. R. Agarwal—Misc. Bull. No. 68 of the I. C. A. R., Manager of Govt. Publications, Delhi (1950).

Wheat after a berseem—cowpea rotation

to year. Much has been made of alfalfa as a wonder working legume in the U.S.A., but a similar role could be played in north Indian soils by berseem (*Trifolium alexandrium*). This is a *rabi* fodder crop, belonging to the clover family, which won fame in Egypt and was introduced into this country in the beginning of this century and is now being grown in several parts of the Punjab, Uttar Pradesh and Bihar. The crop responds markedly to applications of superphosphate and finely ground bone-meal or rock phosphate, and also to small applications of trace elements like boron and molybdenum. The monthly cuttings provide excellent fodder, containing about 3 to 3.5 per cent nitrogen in the dry matter, and the quantity obtained in 4 or 5 cuttings between November and May provides about 700 to 1000 maunds of green fodder per acre. In addition, it is found that soils of average fertility are benefited considerably and the next crop of wheat may show 30 to 50 per cent increase. Wheat, directly manured with phosphate, does not show such good response as when the phosphate is applied to berseem and the wheat is grown thereafter. In certain plots at the Indian Agricultural Research Institute, where berseem treated with superphosphate has been grown in rotation with cowpeas and wheat, without nitrogenous manuring, the nitrogen and organic matter content of the surface soil had increased by nearly 50 per cent in the course of about 10 years; and the fertility of the soil had improved correspondingly.



Wheat without manure on a Delhi soil



POULTRY BREEDING

SELECTION OF BREEDERS

By **S. G. IYER,**
Indian Veterinary Research Institute
Izatnagar

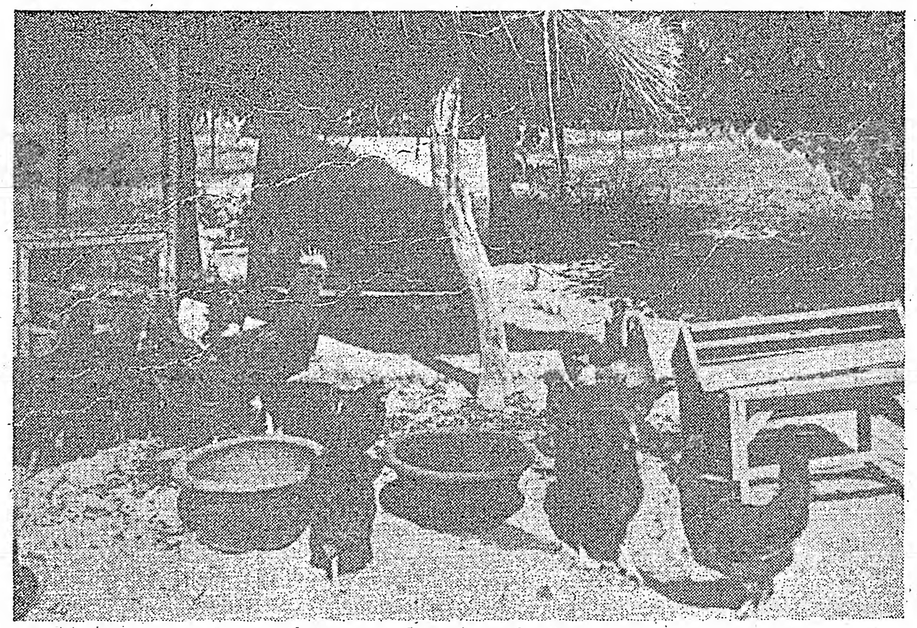
THE total poultry population in India is 69,000,000. It is estimated that 50 per cent of the birds are lost year after year due to disease, accidents, attacks from animals and various other causes, affecting adversely the development of the infant poultry industry. The useful span of life of the fowl is but short and production of replacement stocks in millions every year, is therefore, the responsibility of the poultry breeders.

One of the essential factors in the successful running of a poultry farm is the selection of sound breeding stock. In the absence of good breeding stock, it is impossible to get really good results, for good housing, feeding and management by themselves cannot turn third rate birds into good egg layers. As like tends to beget like, it is essential to select the best birds for the breeding pens. Though it is undoubtedly true that the expert breeders of livestock are born and not made, it is also true that the average person can get satisfactory results by paying strict attention to the fundamental principles involved.

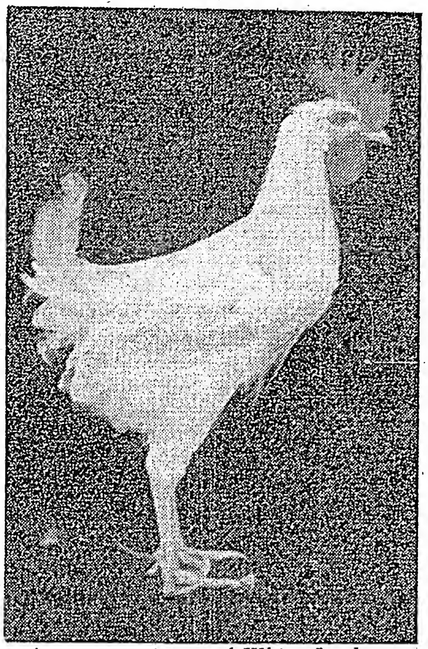
In the first instance, it is necessary to use birds of mature age, for young undeveloped birds will not give as good results as mature birds. Some breeders are averse to the use of pullets (female chickens-age 1 year) in the breeding pens but in many cases breeding from pullets is quite justified. The chief danger in using pullets is that they have not demonstrated their ability to live long which is an inherited characteristic, so that breeding from such birds may result in the introduction of certain factors—which may lower the stamina of the stock. If the pullets are well developed, or are at least 10 months old and have been bred from hens of proven stamina, there should be little danger in breeding from them. The fertility of and hatchability from mature pullets is certainly as good as that from hens and in Western countries many laying test winners have been bred from pullets of known parentage. Hens after their second laying year are usually uncertain breeders than younger birds but really first class older birds are supreme as foundation stock. Though they may produce fewer eggs than young birds, it is advisable to keep them as long as they live and lay. Cockerels (male chickens under one year old), on account of their superior vigour, usually prove more dependable breeders than older birds but it is necessary to keep the very best more than one season. The use of immature males is not recommended as this will always result in bad breeding results.

SIZE OF BODY

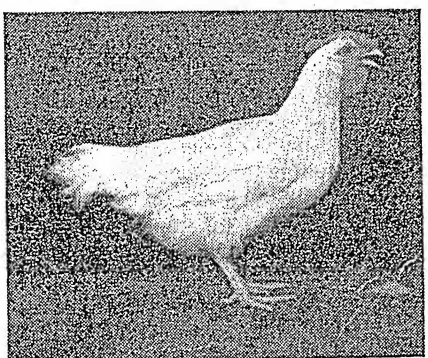
Good body size is essential in breeding stock for selection on egg production performances alone will almost invariably result in a loss of body size and a lowering of vigour. Further, as large birds on the average produce bigger eggs than small birds, body size must be maintained in order to maintain good egg size. The accepted world market standard for the size of eggs is 24 oz. per



A pen of improved Indian fowls



A poor specimen of White Leghorn Cockerel



A good White Leghorn Pullet lays

dozen eggs. A White Leghorn pullet, for instance, must weigh $3\frac{1}{2}$ lb. at the time of maturity to lay eggs each weighing two ounces when the bird is about 8 months old. Coarseness both in the males and females should normally be avoided in egg producing strains, for coarseness is usually an indication of broodiness, low fecundity and poor stamina. In table producing breeds, a certain amount of coarseness is permissible as egg production in such breeds must come second to meat qualities.

BREED STANDARDS

Though many of the breed standards seem to have no linkage or correlation with high egg production the breeder should as far as possible breed from birds which conform to the breed standards. This is especially true in the case of body size, for the best producers and breeders are those which are approximately the same weight as that laid down for the breed. The breeder should try to breed true to the breed standards, otherwise he will soon have a non-descript flock which will not be attractive.

TEMPERAMENT

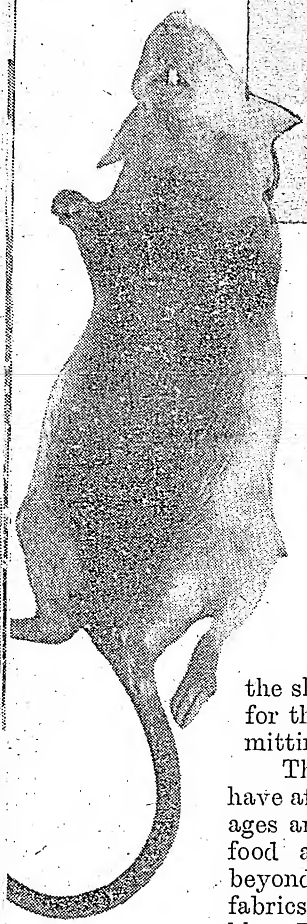
A nervous active temperament is associated with good physique and stamina. A good producer has invariably an alert disposition and is a good forager. Sluggish birds, which are slow to come off the perches in the morning and hide in corners and feeding troughs throughout most of the day, are nearly always poor breeders. In the male, a certain amount of aggressiveness and keenness to fight other males and boss over the females are signs of good stamina. A good temperament is also denoted by a well balanced head and well placed rather bold eyes. The finer points in regard to temperament cannot be mastered from books and a sound knowledge can only be acquired by long and careful study of the birds themselves.

The best breeding results can only be secured by means of the trapnest but the records so obtained should be used with discretion, for birds should not be selected for the breeding pen solely on their trapnest record. However, the trapnest performance in conjunction with selection for body conformation and size is invaluable in building up a good breeding stock. Most breeders tend to place too much reliance on the trapnest record of the individual, whereas much more reliable information can be obtained from the performance of the individual's sisters; an individual bird with a good record from a family with poor records is usually a breeder inferior to one with only a medium record from a family with a good average egg record. The beginner can get invaluable assistance from trapnested stock, for if he is interested in fowls he will soon be able to pick out the characteristics which denote good egg production and stamina. For those who have neither the time nor the facilities for trapnesting, it is useful to remember that the best producers start to lay at a fairly early age, early sexual maturity being correlated with high egg production. Further, good egg producers are persistent layers whereas poor producers stop production early and take a long time to

(*Continued on page 31*)

TOMORIN

A New Raticide



FROM the hoary days when man led a primitive, (and according to some, a far happier) life—rodents, mainly rats and mice, have been his constant scourge. Whatever he grew in his ill demarcated fields, whatever he stored from the meagre fruits of his efforts, he shared with the rodents, whether he liked it or not.

Apart from this heavy economic loss, the next impact of rodents on man was to bring to him a deadly disease—plague—of which he knew nothing, and whose cure he had not the slightest means of effecting. He paid for this attention by the rodents by submitting to hapless death.

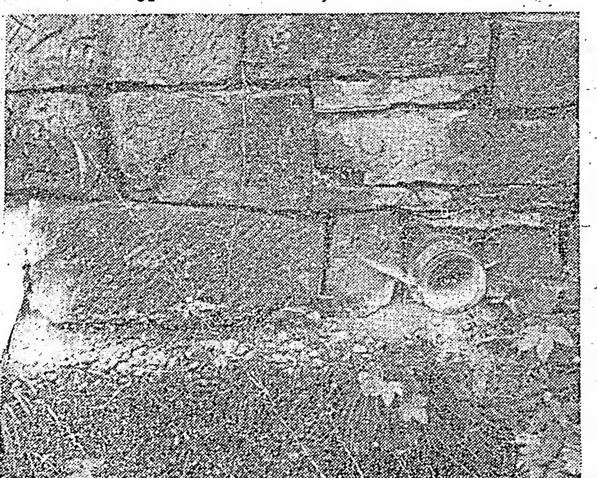
The twin ways by which rats and mice have affected man and his welfare down the ages are still persisting. Millions of tons of food are being eaten away, or damaged beyond human consumption. Damage to fabrics and other finished goods is incalculable. The prevalence of plague is an annual feature in many States, thanks to the association between the rat-flea and the rat. So, in spite of man's ingenuity and resourcefulness, he has not been able, so far, to free himself from the destructive attention of rats and mice.

Rat control is as old as the hills, and the thought and energy bestowed by man on this vital problem is immense. From early days, traps have been devised with a hundred variations, but to the credit of the rats, it must be said that they systematically defied each one of them. The technique of the professional rat-catchers has been developed to a fine art, and yet the rat population has gone up by leaps and bounds. Poison-baits have been studied and employed against rats since the time man discovered these poisons. But all to no avail. The prolific rate at which rats and mice breed, and an extraordinary sense of impending prediliction which God has endowed them with, have enabled the resourceful rodents to escape complete extinction, and continue their nefarious activities.

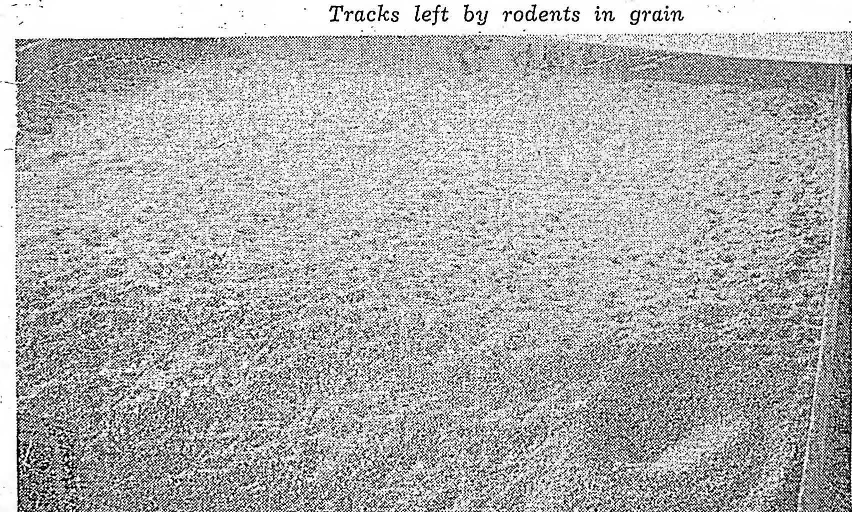
Since the last World War, two other chemical discoveries, the latest one being based upon a Coumarin derivative, sprang into the limelight, each claimed by its discoverers to be the best rodenticide so far. The rodents, however, ignored these claims, and rapidly showed that even these discoveries had certain shortcomings. Whilst admittedly having their own limited uses, they failed to provide the final answer for which man was searching, and they were consequently added to the already long list of poisons which were merely "of use."

More recently however, research work has been carried on with Coumarin derivatives, from an entirely different angle, arguing that, since rats and mice had the habit of licking their fur and paws, a tracking dust should be able to reach their stomach and poison them, if once they scurry over a treated area. The result of

Typical exit holes, treated with Tomorin



Tracks left by rodents in grain



these researches was a remarkable new Raticide—TOMORIN—which is also based on a Coumarin derivative, with the difference however, that whereas the earlier Coumarin raticide was used in the form of baits, Tomorin was purely a dusting powder intended to be applied in such places that rats were sure to frequent.

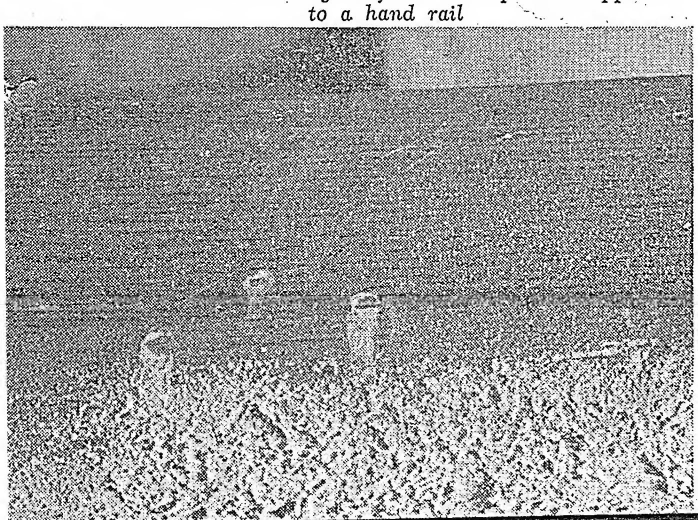
Experiments under Indian conditions already prove that Tomorin is effective against not only all the species of rats and mice one encounters in this country, but also bandicotts and shrews. The greatest advantage, however, is that Tomorin does not present any toxic hazard to domestic animals and human beings in its application against rodents, and when used in accordance with the manufacturers' instructions.

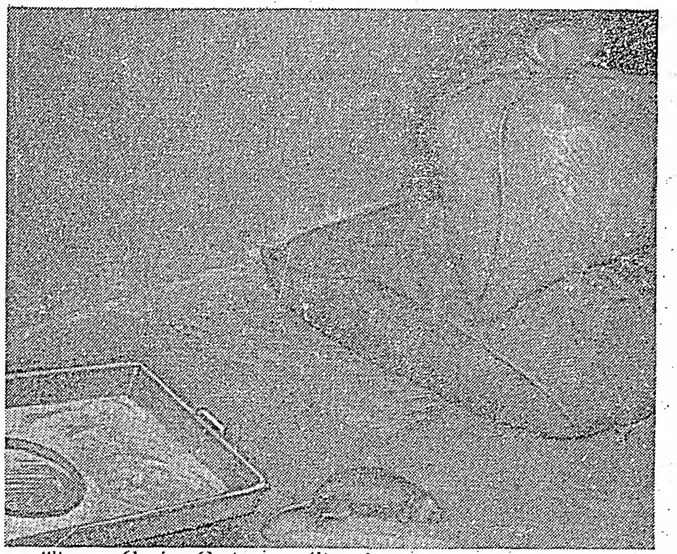
The experiments in India were carried out in large public buildings, a hotel, a bank, several grain storage godowns, a food factory, and in an open compound. The results in all cases were, to say the least of it, spectacular. For the first time in living memory, a hotel was freed from rodents completely and remained free up to the date of this report, seven weeks later. grain godowns proved particularly easy to treat, and in spite of the very large number of rodents killed within the godowns, there was not a single case of corpse smell caused by rat dying in out of the way places. This is particularly important in grain godowns, where a single dead rat, putrifying within a stack of grain bags, could render many bags useless by tainting them. This in fact, is a remarkable feature of Tomorin, that the rodents appear to come out into the open to die, rather, than recede into their nests, as usually happened with other poisons.

The advent of Tomorin has undoubtedly opened up very extensive possibilities in an important field of pest control, since by its widespread use, not only vital stocks of foodstuffs can be saved, but also health and hygiene in our plague ridden villages can be satisfactorily maintained.

Thus has been introduced a product that provides the complete answer to the age old search for a raticide that combines the virtues of supreme efficiency and great simplicity of application, with a welcome economy.

Paw marks in a layer of Tomorin powder applied to a hand rail



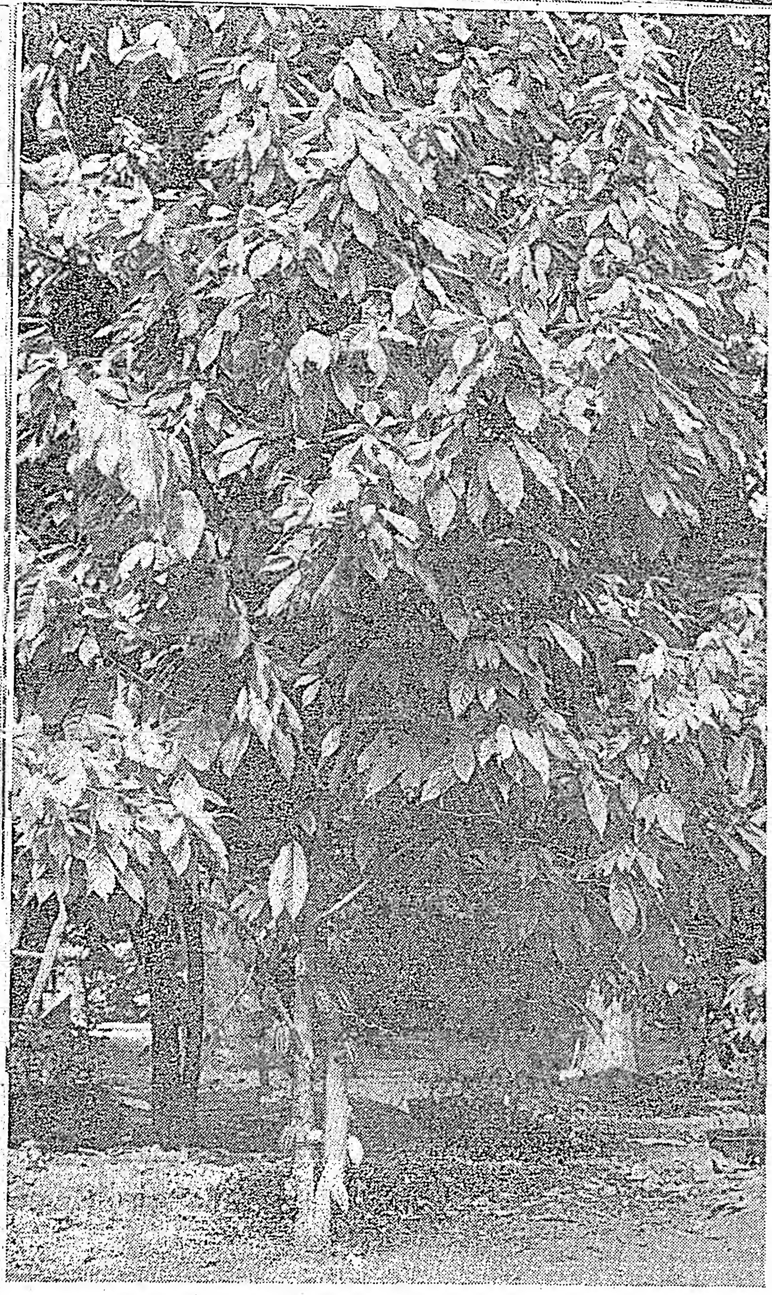


Thana Grain Godown. Showing tray a water bait method of Tomorin application. Results successful, but godown required extensive repairs to prevent fresh infestation from savage system immediately outside main door

Extensive haemorrhages in the internal organs are a sure sign of Tomorin poisoning

CACAO OR THE CHOCOLATE TREE

By **V. S. RANGACHARLU,**
Assistant Fruit Specialist, Coimbatore



Cacao tree in bearing

CACAO constitutes one of the three pricipal beverages of the world the other two being coffee and tea.

CACAO IS NUTRITIVE TOO

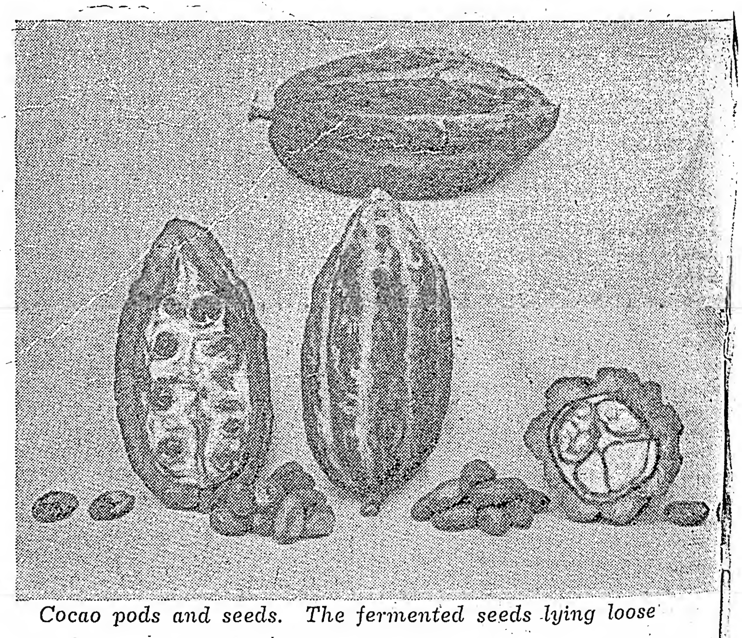
But cacao is not merely a beverage, it is also nutritious. The consumption of cacao and its products the world over has increased enormously during the recent years. The present world consumption is estimated at more than 500,000 tons of which India's share is reported to be in the neighbourhood of about 300 tons on an average every year. Our imports of cacao and its products during the past 10 years or so have been roughly valued at about Rs. 70,00,000.

WORLD SHORTAGE—AN OPPORTUNITY

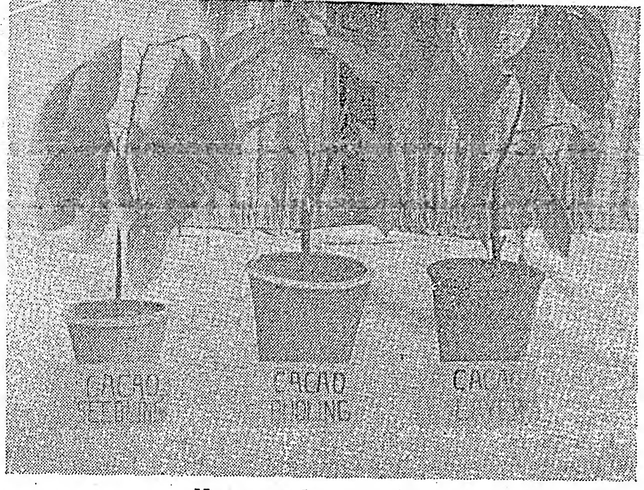
Unfortunately, the world's production today has failed to keep pace with the growing demand. This is largely due to the fact that millions of trees in some of the foremost cacao producing countries of the world like the Gold Coast, are fast being wiped out as a result of a virulent virus disease known as "swollen shoot," all attempts at controlling it having failed. The world shortage in production at present is estimated at more than 63,000 tons per annum with the prospect of a further decline in acreage unless immediate steps are taken to tap new sources of production; for, according to the world's cacao authorities, little recovery is expected in the countries subject to the aforementioned epidemic. Already, it is understood, attempts are being made by British and other commercial interests to exploit new fields of production, particularly in Malaya, Indonesia and in Ceylon to mention a few nearer to ours.

A BLUE MOUNTAIN EXPERIMENT SUCCEEDS

The small experimental plantations established over 30 years ago at Kallar and Burliar in the humid hill regions of the Nilgiris in South India have shown that this crop can not only be grown successfully under



Cocao pods and seeds. The fermented seeds lying loose



Nursery plants in pots

suitable environment but can also yield high quality beans of the very superior Criollo variety.

Further, the world's production at present consists mostly of the coarser Forastero variety, the finer Criollo having almost disappeared from the markets. This is mainly due to the promiscuous mixing of the varieties in most of the cacao producing regions. The former, though hardy and prolific, yields only an inferior product when compared with the latter which on account of its superior quality fetches a price approximately 30 per cent higher than the other coarse types. As such, any country which can market the Criollo exclusively could easily gain a leading position in the international markets for cacao at present.

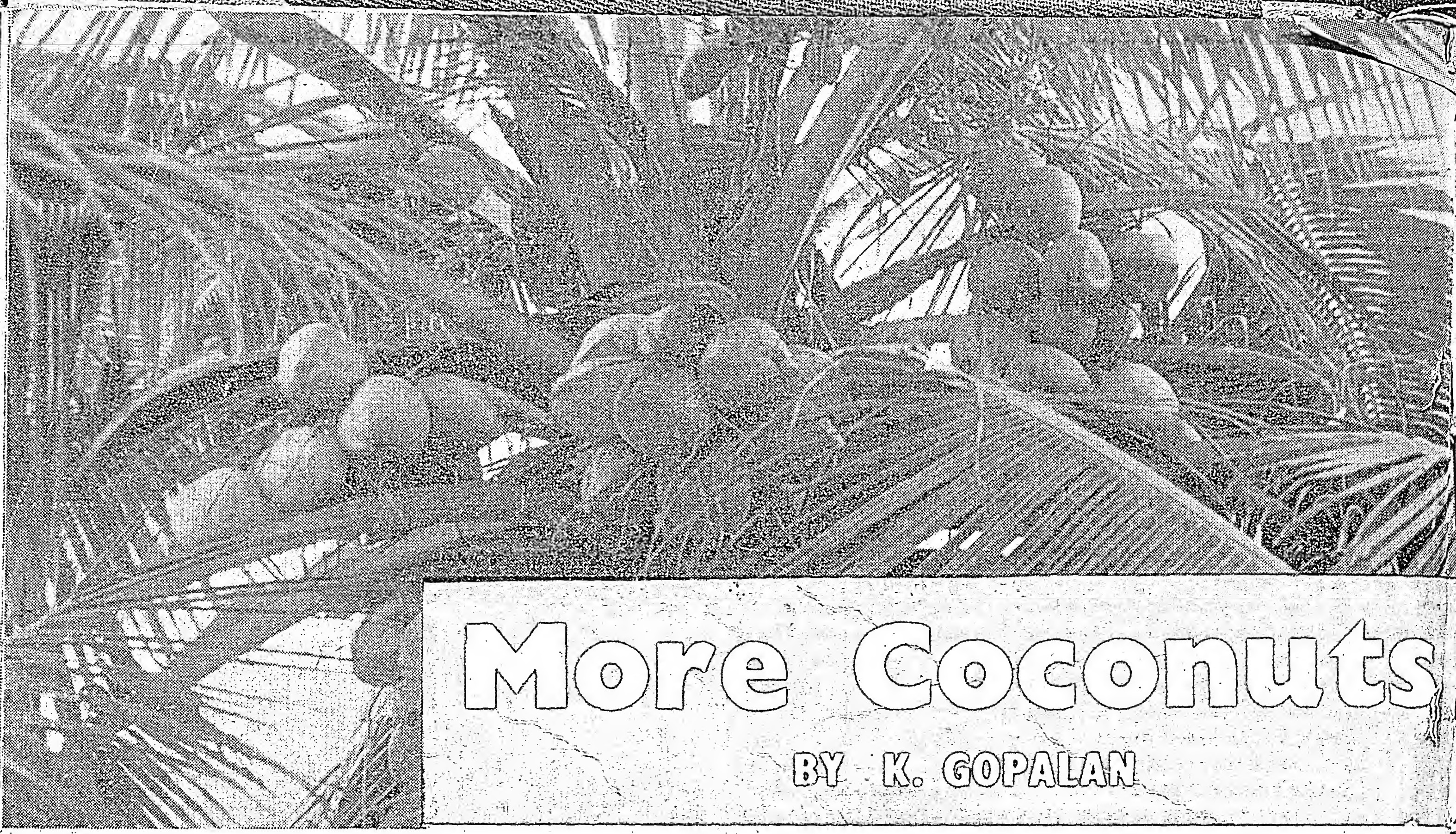
Fortunately for us, the only variety that happened to be introduced into South India was Criollo which has thus remained in a pure form. Recent studies of its performance at Kallar and Burliar have shown that its yields are in no way inferior to those of even Forastero elsewhere. Happily enough, the locally grown trees have remained remarkably free from any of the major diseases or pests found in other cacao growing countries.

A unique opportunity thus presents itself in India particularly for internal consumption as well as export in the southern and south-western States for building up a flourishing cacao industry.

According to well known authorities on cacao, the following four essentials are necessary for successful cacao production :

(a) A temperature of not less than 60° F.
(b) A well distributed rainfall of over 60 inches
(c) A well drained soil rich in organic matter and other nutrients
(d) A well sheltered aspect and situation

None can dispute the fact that India with her diverse climatic and soil features satisfies all these points in a fairly abundant measure. There is enough evidence on hand to show that cacao growing can be successful under our conditions and it can be cultivated as one of our plantation crops.



More Coconuts

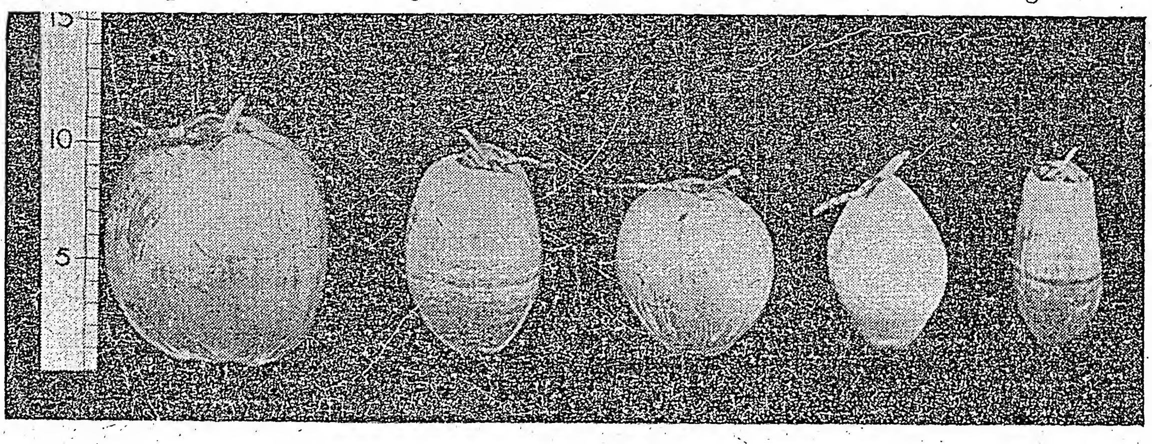
BY K. GOPALAN

ALTHOUGH India with its 1.532 million acres under coconut has the second largest coconut area in the world, she produces only 3432.9 million nuts which are hardly sufficient to meet the country's requirements of the commodity. The country is in short supply to the extent of about 25 to 30 per cent of her requirements. This short-fall is made up in some measure by imports, but that certainly is not the best method of solving the problem of under-production. The problem, therefore, is the stepping up of our production of coconut with a view to attaining self-sufficiency and if possible to create a surplus for export.

GROW MORE COCONUTS

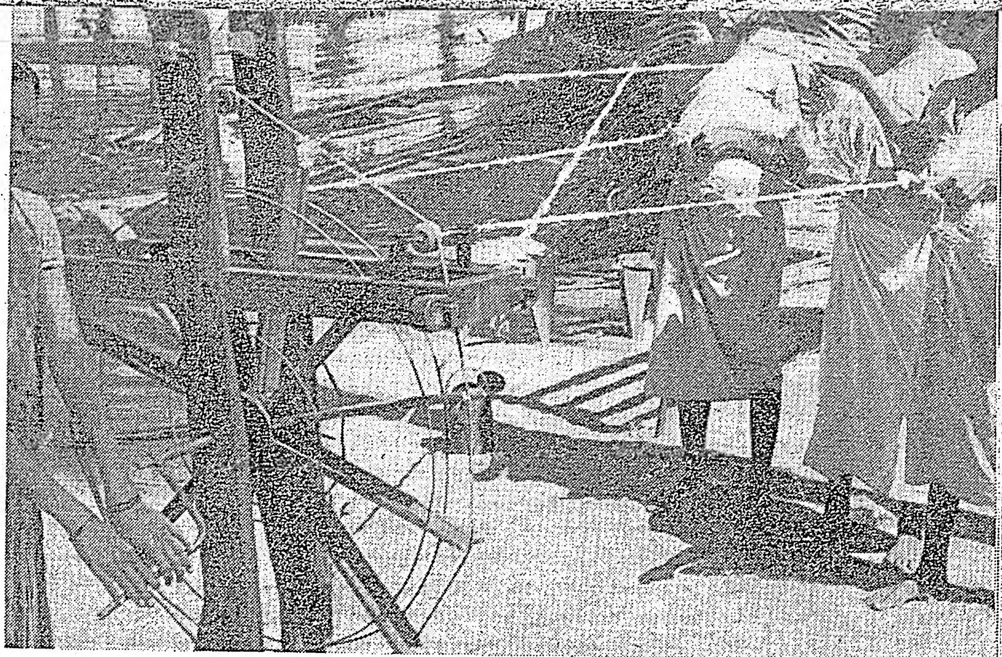
With a view to growing two coconuts where one grew a number of measures have been undertaken both from the short and long term points of view. From the long term point of view our production can be stepped up by bringing more land under coconut. The major coconut producing areas are fully planted up and there is not much additional land available for cultivation. It may, however, be possible to extend the cultivation to a small extent by cultivating coconut on virgin land at the foot of Western Ghats, on the embankments of irrigation canals, on the margins of roads, on either sides of railways, on the borders of rice fields and the banks of rivers and the State governments have been requested to render necessary assistance in this regard. The States of West Bengal and Assam and the Andaman and Nicobar Islands also afford scope for extension of cultivation.

From the short term point of view, investigations have shown that by regular manuring and intercultivation the yield could be raised by about 50 per cent. Popularising the use of manure for coconut on a more adequate scale is, therefore, necessary. Arrangements have been made to distribute manures on a long term credit basis.



Most of the coconut plantations are small holdings belonging to small cultivators who have practically been neglecting them following the economic depression of the thirties. They are being told how to make their plantations yield more.

There are two Central Coconut Research Stations one at Kasaragod in South Kanara, for handling fundamental research and the other at Kayangulam in Travancore-Cochin for investigating the pests and diseases of the palm. Regional Coconut Research Stations have been set up in Travancore-Cochin and Orissa and a few more are about to be set up in Madras and Bombay States, in cooperation with the governments concerned for tackling cultural and manurial problems of a local character.



Spinning coir yarn with a wheel

QUALITY OF PLANTING MATERIALS

In the case of a perennial tree like the coconut which starts bearing only eight to ten years after germination of the seednut and continues to yield for about 60 years, it is of the utmost importance that the cultivator should make sure of the quality of his planting material before he starts a new garden or underplants in an old one. Before the advent of the Indian Central Coconut Committee there was practically no reliable arrangement for the distribution of seedlings of guaranteed quality. Shortly after it was set up the Committee started financing schemes put forward by State Governments for raising and distributing them at a concession price of eight annas each ex-nursery. It is now financing 28 coconut nurseries in seven States with an annual production target of 478,440 seedlings besides running a nursery of its own at its Central Coconut Research Station, at Kasaragod with an annual target of 10,000 seedlings.

SETTING UP MARKETS

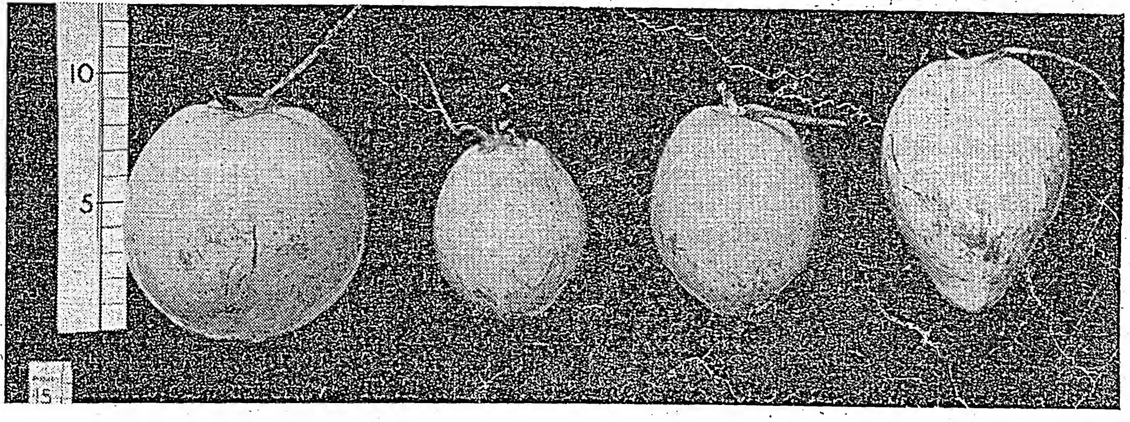
The grade specifications for coconut oil and standard contract terms for milling copra have been drawn up. On the recommendation of the Committee to set up regulated markets for coconuts and coconut products the Madras Government has established such markets in the Malabar, S. Kanara and East Godavari districts while the Travancore-Cochin Government propose to take similar steps. To ensure the manufacture of quality copra round the year irrespective of weather conditions, copra drying is being encouraged with the aid of hot air kilns such as are in vogue in Ceylon. One such kiln is under construction in Badagara by the Malabar District Produce Cooperative Sale Society with a Rs. 12,900 loan granted by the Committee.

At the Central Coconut Research Station, Kasaragod work has been going on on intravarietal and intervarietal hybridization and studies in button shedding, barrenness in nuts, soil moisture, etc. About 15,000 seednuts were planted in the nursery at the Station in June, 1952. About 3,400 coconut seedlings were sold to the public from the Station during April-June.

PESTS AND DISEASES

Investigations of the pests and diseases of the coconut palm have been undertaken at the Central Coconut Research Station, Kayangulam. Insecticidal trials were also conducted against the rhinoceros beetle, the black headed caterpillar, the red palm weevil and cockchafer grubs, all serious pests of the coconut palm, besides virus transmission trials to find out if the root disease is the result of virus attack.

The work of spraying coconut palms with copper fungicides to combat the leaf disease was taken up. During April and May 21,092 trees were sprayed. The total number of coconut trees sprayed from the beginning of December 1951 to end of May 1952 was 68,504.



A crop of China paddy grown at the Central Provincial Agricultural Experimental Farm, Kashmir. Two visitors are seen examining the standing crop

TRIALS WITH CHINESE VARIETIES OF PADDY

By **U. N. CHATTERJI**

THERE is a persistent shortage of foodgrains in India. This is specially well-marked in the case of rice. Rice happens to be the staple food of a large section of people in this country who are generally averse to take to wheat. All possible means, therefore, should be adopted to increase the production of this particular foodgrain. There are varieties of paddy in foreign countries which are known for better agronomic characters. Some of these varieties, which give better yields and are known to be resistant to diseases might possibly be tried in this country and if the trials were successful, their cultivation could be more widely adopted.

CHINESE VARIETIES' HIGHER YIELD

It is worthwhile mentioning in this connection that some trials have already been conducted with Chinese varieties of paddy in this country. Work relating to them has been carried out in various States. The work in Kashmir is of special interest because here it was originally initiated. Certain Chinese varieties of paddy have been introduced into Kashmir and found suitable there. These Chinese varieties take between 120 and 150 days to mature and give yields upto 5,000 lb. of grains per acre in regions where rice is usually grown. These Chinese varieties because of their high yields have become very popular in the State and are being extensively cultivated. They are also said to possess comparative resistance to diseases like blast.

The highly satisfactory results obtained with Chinese varieties in Kashmir have attracted attention. Could they not be introduced to other parts of India with comparable climatic conditions and in localities where short duration varieties are in demand ? It may be mentioned here that some of these varieties under warmer conditions on the plains of India mature between 85 and 105 days. Chinese varieties have been tried in various rice growing States to determine their suitability for particular areas. The information so far available regarding their performance in and suitability to different tracts are encouraging.

TRIALS IN DIFFERENT STATES

Eight varieties of Chinese paddy were tried in West Bengal and were grown both as 'aus' and 'aman.' Most of the varieties failed to form seeds when sown as 'aus' paddy. However, when grown as 'aman' paddy some of the varieties were quite successful. Some of the varieties tried were Chinese 972, China 996, Hunan Victory, China 1040 and C. N. A. B. 4; their life periods varied from 135 to138 days and yields from 20.27 maunds to 37.86 maunds.

In Uttar Pradesh 36 Chinese varieties were under observation. Four of these were tried in 1950-51 on a field scale under broadcast conditions against the standard varieties in unirrigated tracts. Ch. 1 and Ch. 2 yielded 9 per cent and 30 per cent higher than the standard N. 22. Ch. 1, Ch. 2, Ch. 11 and Ch. 41 yielded respectively 44, 4, 73 and 33 per cent higher than A. 46. In another trial Ch. 6, Ch. 10 and Ch. 12 were found better than T. 21 having produced respectively 39, 6 and 14 per cent higher than the standard one.

Some Chinese varieties were tried in Madras. A few have been found to be promising. It was found that they were mostly short duration varieties taking 85 to 135 days for maturing under Coimbatore conditions. Two Chinese varieties Ch. 45 and Ch. 47 were tried at Ambasamudram in Madras. These gave fairly good yields as compared with the local varieties.

Tests with Chinese varieties of paddy have also been carried out at the Central Rice Research Institute at Cuttack. The varieties were grown in the Institute farm as also some of the associated farms attached to the Institute. These trials have been in progress since 1947. Out of a number of varieties studied, Ch. 45 and Ch. 47 were found to be the best and were put under regular yield trials for three years. These varieties gave yields of 1572 and 1497 lb. per acre in life periods of 105 days and were comparable to the other short duration varieties like Ptb. 10 and Adt. 20 of the same duration obtained from Madras. Another variety Ch. 2 had the shortest duration among the varieties worked with and matured in 85 days. This was compared with Ch. 45 and Beni Bhog, a local short duration variety. In the trial Ch. 45 did better than the local variety while Ch. 2, with a very short duration, gave about 80 per cent of the yield of Ch. 45.

Another trial was carried out in 1951-52. In this trial more Chinese varieties were chosen and compared

China paddy crop at the Central Provincial Agricultural Experimental Farm, Kashmir. It shows a high number of tillers per plant. In spite of distant transplantations the heads present a compact appearance

with Beni Bhog and Madras varieties Ptb. 10, Co. 13 and Adt. 20. The crop periods in all these varied from 105 to 110 days, and the output of the Chinese varieties Ch. 45, Ch. 47, Ch. 54, Ch. 62 and Ch. 63, varying from 1304 lb. to 1665 lb. per acre, was on the whole favourably comparable with that of the others except Adt. 20 which produced 1870 lb.

The Chinese varieties Ch. 2, Ch. 45 and Ch. 47 were also compared for yield against DI. 4 a local second crop variety and Ptb. 10 and Co. 13. It was evident from the results that the Chinese varieties were suitable for the second crop season in Orissa, although the other varieties were equally good or even better. Chinese varieties have white rice of medium quality and were found fairly resistant to diseases.

D. V. C. IN FIELD

The Damodar Valley Corporation were supplied with seeds of some Chinese varieties. The Corporation reported that the Chinese varieties had impressed the local farmers well because of their earliness and ability to mature even under abnormal drought conditions.

There is a general impression in various States that the Chinese varieties will do well. But at the same time it must be admitted that the possibility of their general adoption by paddy cultivators in this country must be more critically examined and thoroughly explored and for this purpose cooperative trials with a number of Chinese varieties are being conducted in various ricegrowing States by the Central Rice Research Institute, Cuttack.

Photographs for this article were supplied by Shri G. M. Butt, Director of Agriculture, Jammu & Kashmir, Srinagar.

INCREASING YIELDS BY COMBATING EROSION ON THE STUDENTS' FARM

By **D. G. DAKSHINDAS,** College of Agriculture, Nagpur

AN effort was made to get better yields of *kharif* crops by combating the ill effects of soil erosion and surface run off on the sloping fields of the second year students' area of the Nagpur Agriculture College during the *kharif* season 1951-52.

SITUATION OF THE FIELDS

The three acres of second year students' fields of the Agriculture College were situated at two different places. One acre of cotton was situated in field No. 2 of the College farm. Two acres—one for *juar* and and one for *tuar* were allocated in a part of field 8-A. This portion of the field was very slopy, slope being in the south-north direction to a greater extent and west-east direction to a lesser extent. On account of this slopy condition, water ran down and flew, across and accumulated in the students' fields. This caused erosion of soil and surface run off. And due to surface run off and underground movement of water, the field remains water stagnated for a long time.

WEATHER CONDITIONS

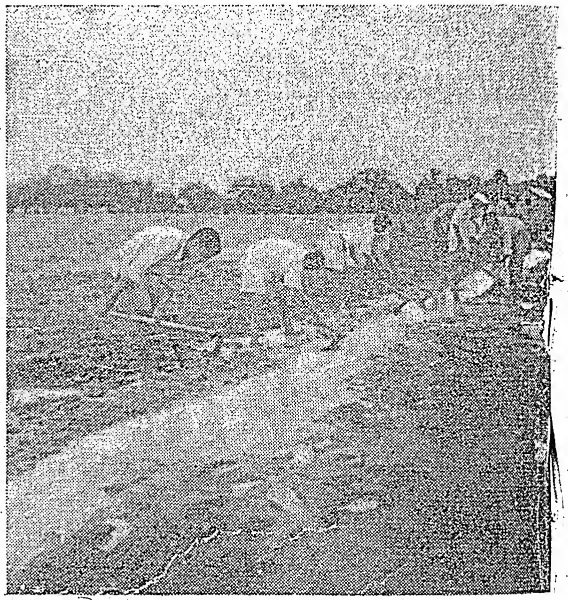
The monsoon during the year had started by the 18th of June, but did not set till the 24th when good showers (0.95 in.) were received.

The land was *bakhared* in the last week of June and crop stubbles picked and removed. Another *bakharing* was given just before sowing. Cotton was sown on the 29th of June. Cotton was sown by the local system called "baroli", i.e. 12 lines of cotton had alternated with every two lines of *tuar*. It is probable that this method, in addition to forming a sort of simultaneous rotation with legume, affords protection to the main crop of cotton. This arrangement also facilitates work by students in batches as the cotton field is subdivided into plots by the alternating lines of *tuar*. On the cultivator's field this is likely to permit labour control. Tuar crop sown in this fashion is said to yield better than when entire field is sown is *tuar* alone. It was observed last season that the plants of three *tuar* lines showed more branching and better pod filling. This observation was substantiated by actual yields calculated in area basis the yield of *tuar* from this alternating lines was as much as 2,016 lb. as against 650 lb. obtained from the entire one acre field of *tuar*. This perhaps is the reason why *tuar* is always sown by a majority of cultivators in mixture with other crops and rarely as a pure crop.

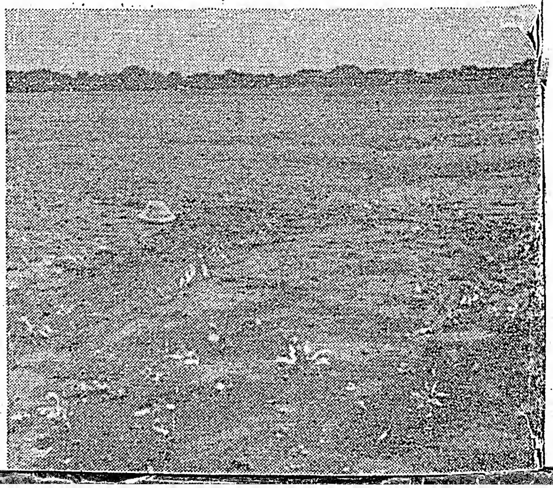
Juar and *tuar* sowing were done on the 14th July. Germination of all crops was satisfactory. However, setting in of monsoons was followed by an anxious period of break and week showers during the last fortnight of July and further by a period of continuous rains in late July and early August. This resulted in profuse growth of weeds, checking the growth rate of main crop and making them stunted. The peculiar lie of these fields of *juar* and *tuar* made the situation worse. Slope coupled with bad drainage resulted in the accumulation of water from the stretch of fields in the north into the *juar* and *tuar* fields thus causing

Run-off water causing gullies and soil wash

2nd year students of Agricultural College, Nagpur, picking cotton in their field



Construction of bunds to check surface run-off



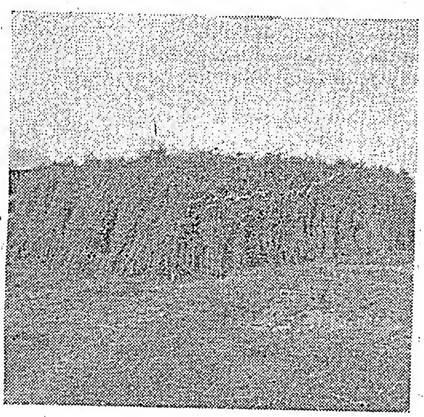
Stunted growth of juar *due to water stagnation and surface run-off*

big gullies and scurrying the soil at various places. This resulted in the stunted growth of crops and at places blank patches were left.

COMBATING SOIL EROSION AND RUN OFF

Due to conditions noted above a severe failure of crops was feared and means had to be devised to

The condition of the field during rains



The heap of tur—from 2nd Year students' one-acre field

Rain-water flowing in gully from higher to lower fields

overcome the situation. The students rallied round and prepared on the 2nd August 1951, a bund across the western border to check the large volume of water flowing in from outer fields. The water was thus directed to go into drains along the road. However, it was found that though surface run off of water was checked to great extent, underground movement of water from higher portion to lower fields continued, keeping the field down below stagnated. For this small surface drains were prepared in the fields to let out water. This helped the soil to come into working condition much earlier.

STIMULATING GROWTH BY FERTILIZER APPLICATION

The delicate and slender condition of *kharif* crops, resulting from the early period of water stagnation, was improved to a great extent by a dose of ammonium sulphate which was broadcast in the cotton and *juar* fields on the 21st August at the rate of 15 lb. of nitrogen per acre. This was followed by hoeings and weedings from time to time as permitted by the weather conditions. The result was that within a month's time the crop improved to a great extent and showed a vigorous growth.

The monsoon became very weak by the end of August, and during September and October only 5.4 ins. and 3.9 ins. of rain was received respectively. The moisture in the field had to be maintained by continued stirring of soil and checking surface evaporation. About four hoeings were given after fertilizer application to keep off weeds and conserve moisture. The condition of cotton was not what it could have been, because of the field being very much weedy and weedings could not be undertaken oftener. Due to Divali vacation given to students first picking was delayed till the 17th November and was followed by only two more pickings at about intervals of about 3 weeks.

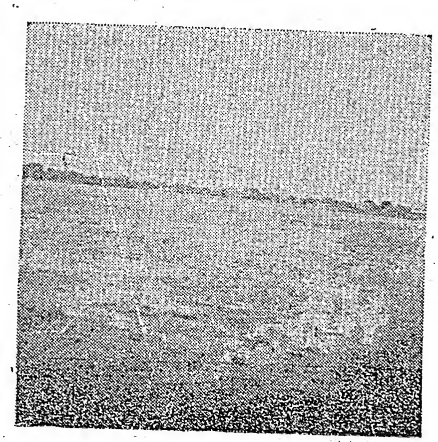
In spite of the fact that the field where students plots were situated, was ill drained and slopy, it was possible to obtain very good yields last year. Though weather conditions might be responsible to a certain extent for the higher yields. But the main credit goes to the students. They constructed at the appropriate time the bund to check surface flow of water into the field and the surface drains. The growth of stunted pale plants was stimulated by a top dressing of nitrogenous fertilizers. And the hoeings that were given, helped to step up production.

The following are the yield figures obtained from one acre each of cotton, *tuar* and *juar*.

Area	*Yield*
COTTON	
1. One acre (less area occupied by *tuar* lines)	633 lb. *capas*
2. Calculated from above for one acre	706 lb. *capas*
JUAR	
One acre.	1800 cobs 1430 grains 6000 lb. *kadbi*
TUAR	
1. One acre	650 lb. grain
2. Tuar sown in lines in cotton field	288 lb. Total 938 lb.

The students by their practical work have been convinced of the fact that very good yields (more than twice than the normal yield of a cultivator) are possible to be obtained provided care is taken to :

1. Sow the crop in time in a well prepared seed bed.
2. Remove, wherever necessary, adverse conditions created by ill-drained soils and by constructing suitable land and surface drains check erosion and surface run off.
3. Give a top dressing of a nitrogenous fertilizer after the period of heavy rains in July and August, in order to stimulate growth rate.
4. Keep the soil in between plant rows stirred and clean by giving as many hoeings and weedings as possible.



The condition of the fields during rains

AGRICULTURAL NEWS FROM PUNJAB & MYSORE

PUNJAB

Cotton : The work of improvement of cotton crop in the State is being carried out under five schemes financed by the Indian Central Cotton Committee. Under one of the schemes efforts are being made to evolve suitable medium staple cottons for the Hariana tract. One early maturing and drought resistant variety, numbered as 216F and christened as Hariana *kapas*, has already been isolated from American varieties and given out to the cultivators.

Efforts are being made to improve this cotton still further, and some better strains are in the offing. The second scheme aims at the multiplication and distribution of the seed of Hariana *kapas* and is in full swing. The third scheme envisages the evolution of suitable medium staple cottons for cultivation in the central districts.

The aim of the fourth scheme is to increase the area under L. S. S. Cotton in Ferozepur district. According to the fifth scheme, medium staple cotton superior to L. S. S. are to be evolved. Besides the Government of India is financing the Cotton Extension Scheme, according to which the seed of improved cottons is to be supplied to the cultivators and all possible help to be rendered to them by way of improving water supply, arranging for fertilizers, controlling of pests and diseases, etc.

Wheat : A variety numbered as C. 281 and suitable for the Rohtak, Gurgaon and Hissar districts has been hybridised and given out to the cultivators of this tract. On an average it gives 2 maunds of wheat per acre more than the standard variety C.591.

Barley : The Department of Agriculture has a barley breeding substation at Gurgaon since 1937, where efforts are being made to improve the appearance of the famous malting and brewing barley Punjab type 4.

Rice : From the experiments conducted at the Rice Breeding Sub-Station, Gurdaspur, it was found out that mid-June transplantings gave greater yields. Gurdaspur is situated in a sub-montane tract, and has an assured water supply in the form of natural precipitation supplemented by artificial irrigation. Again, application of 40 lb. of nitrogen in the form of ammonium sulphate proved to be the most economical dose for paddy.

MYSORE

EXTENSION PROJECT

Extension work has been going on in the State for the last few months, with the coming of the American experts.

It is proposed to train personnel for running the community projects starting with the Shimoga district. The persons trained for the Ford-Foundation Pilot centre, located at Malavalli in the Mandya district, have taken up their work in right earnest.

Agricultural Education : Agricultural education, especially that given in the Kannada agricultural schools has been modified, so as to admit farmers' sons for a practical training of six months, the idea being to equip them with the knowledge of improved agricultural methods thereby making infusion of progressive ideas into the villages easy.

The Mysore Agricultural and Experimental Union : The Union consisting of subscribing members affords the Department of agriculture a ready medium by which to bridge the gulf between agricultural research and the common man's farming. The Union publishes two journals a Kannada monthly and an English quarterly. During the last one year the Union has sponsored holding of field days in the villages comprising of farm operations competitions, exhibitions of cattle and machinery, etc.

—M. V. MURTHY

QUESTIONS AND ANSWERS

Question :

We planted some turmeric rhizomes as a trial crop in the last season. The crop was excellent. But as there is no market for raw turmeric in this locality, would you kindly let us know one or more simple and practical methods of curing turmeric ?—Farm Manager, Govt. Farm, Pasighat.

CURING OF TURMERIC

Answer :

The harvested crop is first *cleaned* of earth and other foreign matter and subjected to a slight *sweating* by keeping it in heaps covered by turmeric leaves for about 1-2 days. It is then taken out and *shaped* by splitting "rounds", cutting longer "fingers", etc., into uniform size and shape to facilitate uniform processing and curing. Next step consists of *boiling* in large vessels of water (sometimes with the addition of a little cow-dung or a few turmeric leaves). Recent experiments in the Council's scheme in Udayagiri (Orissa) showed that the finished product by using steam alone was superior to other methods where turmeric leaves and cow-dung were used. However, when the material becomes sufficiently soft due to cooking and yields, to a slight pressure between the finger and the thumb (somewhat like the boiled waxy potato), it is taken out and *dried* in sun for about 7-8 days. The well dried material is then cleaned and rubbed well (sometimes with a little turmeric powder).

It may be added that in the Turmeric Research Scheme, Orissa, improved furnaces and polishers are already evolved, after years of research, for the benefit of turmeric growers. The economics of the working of these furnaces have also been worked out. (I. C. A. R.)

Question :

The flowers of mango trees are usually destroyed during cloudy weather, by some pests. What steps should be taken to prevent this ? (B.K.I.)

Answer :

Mango flowers are generally infested with the pest known as 'mango hopper'. For the purpose of preventing damage from this pest, spraying with D.D.T. (0.16% to 0.25%) has been found useful. The spraying should be done as soon as the bunches of flower make their appearance in the beginning of the spring season. DDT emulsion or wettable DDT (Guesarol 550) can be used in the strength as stated above.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HOW TO GET THE MAXIMUM BENEFIT FROM THE APPLICATION OF FERTILIZERS

By R. D. VERMA,
Division of Agronomy,
Indian Agricultural Research Institute, New Delhi.

Fig. I
METHODS OF FERTILIZER APPLICATION

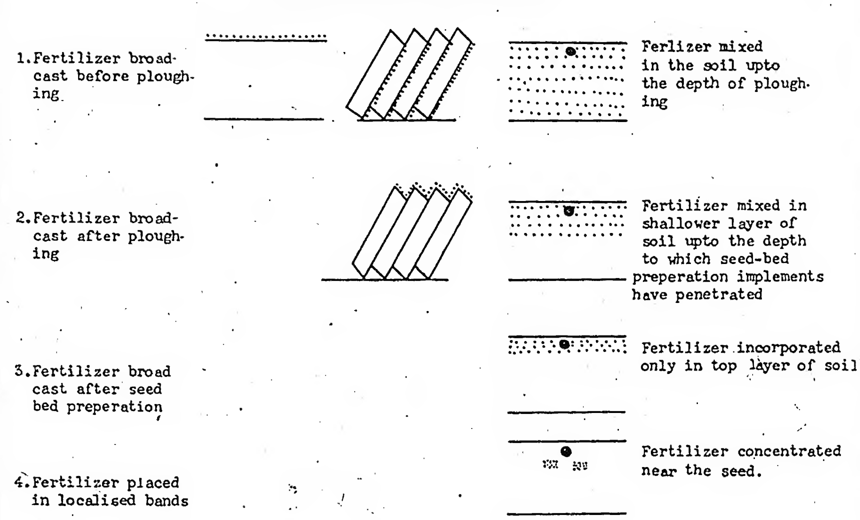
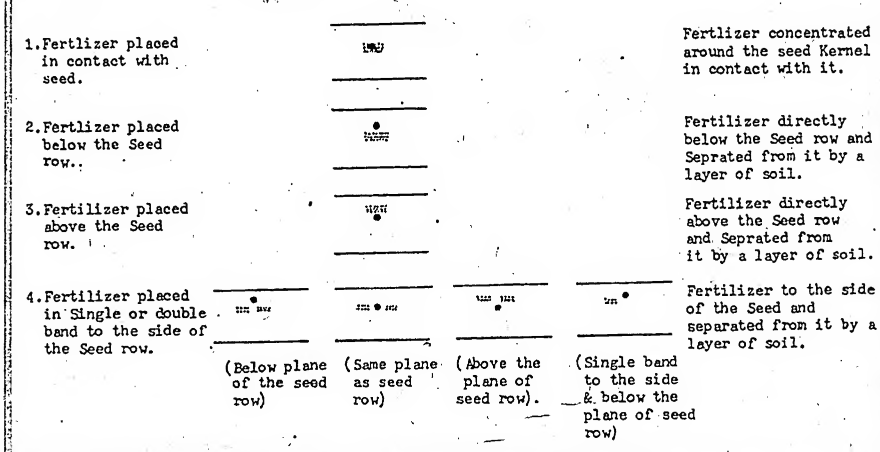


Fig. 2.
METHODS OF FERTILIZER PLACEMENT.



In countries like the U.K., the U.S.A., Australia, agricultural scientists have shown, that to get the full benefit from the application of fertilizers, it is not only sufficient to know what and how much manures to apply to a crop, but *how* to apply it, is just as important. As a result of their findings, the traditional method of broadcasting the manures, has generally been replaced by more scientific and economical method called *placement of fertilizers*. In India, however, this important aspect of manuring has yet to receive sufficient attention. The primary object of this article is to draw the attention to this important subject

WHAT IS PLACEMENT OF FERTILIZERS AND WHAT ARE ITS ADVANTAGES

The placement of fertilizer simply means that the fertilizer instead of being broadcast at some stage before sowing, is drilled, in localized bands, near the seed at the time of sowing. Fig. 1. The advantages of such a method of application are obvious. Firstly, because the fertilizer has been placed near the root zone, it becomes readily available to the crop plants and is, therefore, more fully utilized. Losses of valuable nitrogen due to leaching, deintrification, uptake by weeds, are greatly reduced. The phosphates which become quickly fixed and immobile when once applied to the soil, are better utilized. Secondly, because of the better availability and utilization of fertilizer when suitably placed, substantial increases in yield generally result as compared to equivalent quantity applied broadcast; or alternatively, smaller quantities when placed give comparable yields to larger quantity applied broadcast.

HOW TO PLACE FERTILIZER

In agriculturally advanced countries, where placement has become an established practice, placement machines have been devised for this purpose, but they are rather complicated and expensive for use under present Indian conditions. Moreover, even these machines, have not proved to be entirely satisfactory in all respects. A simple and efficient device suitable for our conditions has already been developed by the author which enables the fertilizer to be placed at any desired position. This device and its working has been fully explained in the article " A simple device for the placement of Fertilizers " in the July 1952 issue of *Indian Farming*.

WHERE TO PLACE THE FERTILIZER

Fertilizer may be placed at any of the following positions: (*i*) In contact with the seed, i.e. seed and fertilizer is drilled together, or (*ii*) it may be drilled a suitable distance away from the seed (*a*) above or below it or (*b*) on one or both sides of it. (Fig. 2).

It has been found that there is no single method which can be considered best for all crops. The method of placement varies with the crop, fertilizer, weather and the soil.

Research workers in other countries have generally found that:

(*i*) readily soluble nitrogenous and potassic fertilizers prove harmful to germination if placed in contact or too near the seed. Such fertilizers must, therefore, be applied at a suitable distance away from the seed. On the other hand, phosphatic fertilizers have no such adverse effect and give best results when placed in close proximity to the seed. In normal quantities they can safely be drilled with the seed.

(*ii*) Cereals have generally been found to be less adversely affected by contact or close placement than other crops—particularly legumes.

(*iii*) for quick growing, shallow rooted short duration crops, side-band placement has generally proved better than other methods. But for deep rooted crops, better results have been obtained by fairly deep placement directly below the seed row. In long duration, deep rooted crops and in dry season broadcasting is just as good as placement.

(*iv*) Placement of fertilizers has been found to be particularly effective on soils of low fertility. On such soils small amounts of fertilizers when placed have given very high increases in yields.

WORK AT THE INDIAN AGRICULTURAL RESEARCH INSTITUTE

Realizing the importance of placement of fertilizers, experiments have been conducted by the author and his colleagues in the Division of Agronomy, I.A.R.I., on two crops, potato and maize. Detailed results of these experiments will be published separately in due course. However, in this article brief reference is made to the increases in yield which have resulted from the placement as compared to the broadcast application of different fertilizers. This would indicate that under our conditions substantial increases in yield can be obtained at no extra use of fertilizers, if suitably placed.

In an experiment conducted by the author on the potato crop, broadcasting of different dozes of N.P.K. fertilizers had been compared with two methods of placement; (*a*) Fertilizers placed in a band one inch directly below the seed tubers and (*b*) fertilizer placed on both sides of the tuber 2½ ins. to the side and 1 in. below the level of seed tubers. Results have indicated that both the methods of placement give higher yields and among the two methods of placement, band placement on both sides of the tuber is superior to single band placement directly below the seed tuber. Increase in yields over broadcast method, of up to 7.8% has been obtained from treatment (*a*), while double band placement has almost doubled this increase to 14.5%. It has also been found that better yields are obtained when nitrogenous fertilizers are applied on the sides of the tuber 2½ ins. away from it, and phosphatic fertilizers below the seed tuber as in treatment (*a*).

Further, equivalent, yields are obtained with 25 to 30% less of fertilizers when placed than when they are broadcast.

On other crops, like maize, under study in the Institute, similar good results have been obtained and increase in yield of up to 33–4% has been obtained by placing the fertilizers directly under the seed that is ploughsole method. The detailed results of these experiments will be published in due course by respective authors.

The results of the pioneer experiments reported above have clearly shown that there is considerable scope in effecting increases in yield and economy in fertilizer use, by placement of fertilizers under our conditions. Although, these studies are being extended to other major crops in this Institute, yet it is necessary that this subject be studied on all-India basis, because as already stated, the best method of placement varies with the crop, fertilizer, soil and weather conditions.

POULTRY BREEDING

(*Continued from page 15*)

come back into production. Therefore even without trapnesting valuable information can be obtained by a system of marking, using coloured leg bands, early and late producers.

INBREEDING

Inbreeding has the undoubted advantage of fixing good characteristics but unfortunately it also has the disadvantage of fixing bad characteristics which may remain dormant. Normally inbreeding is not a safe system to adopt by beginners, for inbreeding without very extensive culling may lower hatchability, increase mortality in the young stock, decrease the rate of growth and increase the age of sexual maturity.

THE MAN OF THE MONTH

(*Continued from page 6*)

In those days, the practice was more universal than now, that one either played games or studied books. Bishan Mansingh did both successfully. I therefore asked him what rules he followed in the game of agriculture. He gave me his 10 commandments. They are :

1. Utilize every inch of land most effectively.
2. Manure your land well. Cultivate it systematically so that the yield can be increased to the maximum.
3. Always use the best seed.
4. Grow several crops ; this is more advantageous.
5. Grow at least one crop of which the yield is certain.
6. Grow green fodder crops after harvesting your general crops, so that you may not have to purchase fodder.
7. Improve your soil. Make unculturable land cultivable.
8. Keep only so much livestock as you can feed well.
9. Keep only serviceable animals ; the weak and sick cattle only eat without doing any work.
10. Keep sheep for wool.

I shall always remember Bishan Mansingh as I saw him at the end of my trip to Habeeb Farm. A tall erect man, with staff in hand, standing amid his fruit trees, while the rain beat all round him, issuing orders to his son and other workers : "Don't forget ammonium sulphate ; look out that the *bundhis* are intact ; destroy the 'gundhee bug'." A true agriculturist, I thought, in all the fibre of his being. Sixtyone but still going strong.

—A. R. VYAS

EDITORIAL NOTES

(*Continued from page 3*)

of the community discover that they can act as leaders, subsequent activities will prove to be much easier.

The extension worker never issues orders, but he offers suggestions and encouragement. It may be considerable trouble for some members of the village community to make a special trip to buy a pulley and a rope ; but even so, this is better than the extension worker making these purchases himself. Finally, when the pulley has been installed and the leaders and villagers discovered the satisfaction of achievement, they will be ready to tackle bigger problems.

SATISFACTION AND SERVICE

Every activity that the extension worker participates in should be dominated by the action of village leaders. For example, some village extension workers are planning bulletin boards on which pictures, announcements, posters, and various other items will be pinned. The temptation will be for the village extension worker to maintain these bulletin boards himself. Even this activity will be more valuable if some village leader can be encouraged to take an interest in keeping the bulletin board attractive and up-to-date. As more people discover the satisfaction derived from being of service to their community and as more people realize the unlimited opportunity available for community and self improvement through self-initiative and action, the whole spirit of the village will improve.

As these leaders develop, the village extension worker will develop also. But he need never to fear the loss of his position because of the emergence of local leadership. He always will be looked upon as a real teacher and leader and everyone will give him credit for all the achievement even though the credit for each individual achievement is always awarded to the active members of the village itself.

Without the development of local leadership any personal achievement obtained by the village extension worker will be lost. The only durable results are those that come through the interested action of the people who eventually benefit by these results. This has been demonstrated many times. It is only those workers who maintain as one of their main objectives the development of the people who will be able to stimulate any worthwhile material development in India's villages.

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IMPORTANT AND URGENT

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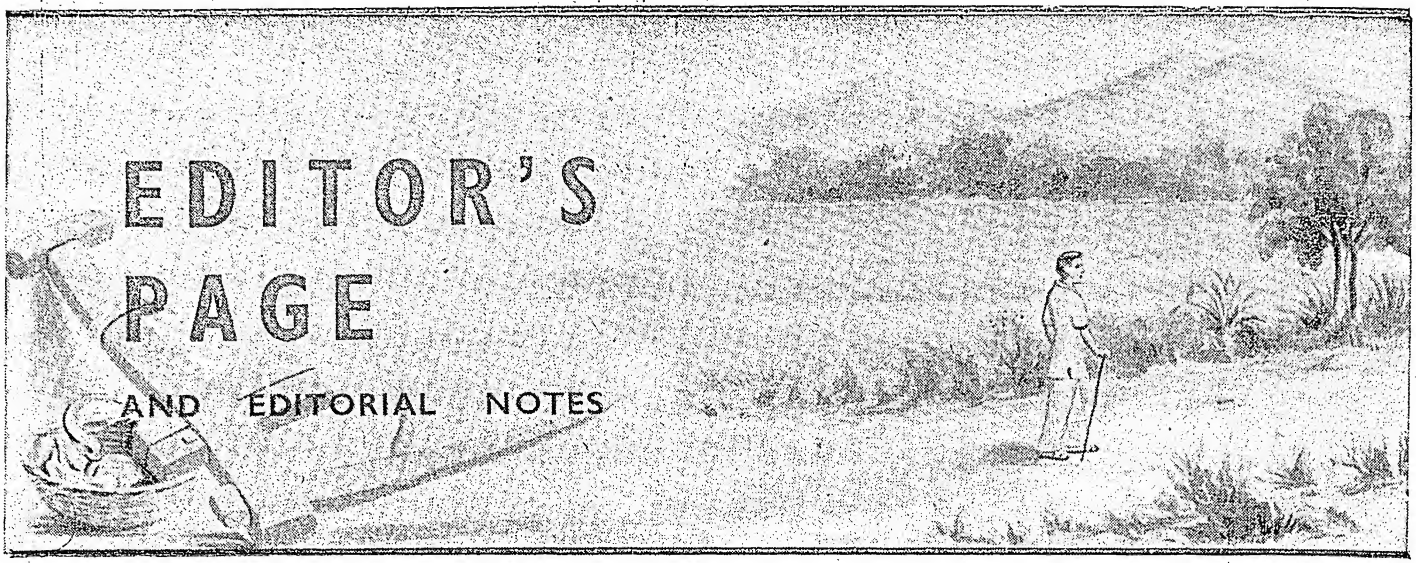


THE LUCKNOW CONFERENCE

People must be conditioned to greatly increased agricultural production. The challenge of this educational problem in India is staggering, and cannot be met by isolated groups working alone. The All-India Agricultural Information Conference scheduled this month in Lucknow can do much to reduce this educational need by enlisting and coordinating the efforts of the various agencies in the country to support the information programme. Such a conference brings together agricultural specialists and extension workers, farm paper and radio editors, cooperative representatives, representatives of machinery, chemical and other trade groups, and information representatives of central and State ministries.

It should be the aim of the delegates to this conference to plan ways to *reach all the farmers* in India. These farmers must be inspired to make the *best use of every cultivable acre of land.* This aim calls for modern communications techniques to supplement the old methods which reached only a few farmers.

An information programme should be planned to arouse interest in the best use of land and to carry information on the best farm practices to the farmer. This information should be supported by scientists and specialists.

To arouse interest, the importance of increased production may be stressed to both farmers and city people. Increased yields to reduce grain imports and thus improve the economic position of the country need continued publicity.

Ways must be found to widely circulate success stories. Stories about achievement of individual farmers offer one of the best ways to encourage the adoption of better practices.

It is hoped that the Conference will analyse the potentialities and limitations of the press, radio, visual aids, and other media for the use of this important campaign. The Conference should decide on practical ways to coordinate all media to get the maximum effect.

One of the most hopeful developments is the cooperation already demonstrated by the private trade groups interested in agriculture. If these trade groups and government can crystallize some kind of a practical cooperative organization interested in the promotion of agricultural education through mass communication means, the Conference will have been a success. On the other hand, the success of any mass educational programme will be eventually measured by the achievement on a village level. Plans will, therefore, be centred around community development, community demonstrations, and individual development and demonstration. The organization will not be easily completed, nor will the execution of any plans come without effort. *But the achievement of the larger aim is essential. There is no alternative.*

INFORMATION AND INFORMATION

"Information" or "publicity" as an organized function comprises two closely inter-related, yet distinctly different kinds of activities. Both employ the same media and methods. Both have the same fundamental purpose: increasing knowledge. In specific orientation, however, the two are quite different and it is highly important that these differences be recognized in planning an information programme and the organization for carrying it out.

"Public information" or "publicity", as the term is used here, has as its primary objective: to create and maintain a sympathetic public understanding and acceptance of a particular government programme or point of view. In a narrow sense, the purpose of this type of information activity is to 'sell' a programme or agency to the people and keep it "sold". It is to government what advertising is to the private business firm. And,

like commercial advertising, "public information" is intended to benefit, *in the first instance*, the particular agency of government whose programme and accomplishments it is publicizing. That is to say, it might be considered as being conducted principally for the benefit of the "supplier" yielding only indirect benefits to the "receiver". Beyond this narrow conception of purpose, however, public information activities of government play a vital role in a democratic society. Only a public which knows and understands the pros and cons of alternatives can exercise the enlightened free choice so essential to democratic government in the best interest of all the people.

The other major branch has in some countries been termed "extension information". This type of specialized information activity is concerned primarily with acquainting farmers, businessmen, manufacturers *et al* with improved techniques in their respective fields and encouraging their adoption. An extension information programme, therefore, is aimed specifically toward making the fruits of research and operating experience quickly available to a large number of potential users in the interest of increasing efficiency and thus raising the general standard of life. It is intended to benefit, *in the first instance*, the "receivers" of the information on improved techniques, secondly, the whole population and indirectly, the "supplier" of the information. This branch of government information activities also has its counterpart in the commercial field. The market news reports, educational materials, etc. which many firms supply to their customers or the general public are in the nature of service information as contrasted with pure advertising.

No one would contend seriously that a hard and fast line can or should be drawn between "publicity" and "extension information" either in principle or practice. The two are inseparably interwoven. Either produces both kinds of results—*but in a different order*. This distinction seems to warrant special attention in an overall information programme and organization. A programme geared specially to "publicity" goals usually is a rather ineffective means for getting research results in the hands of those who can use them. It usually is even less effective in stimulating people to adopt practices recommended since publicity characteristically is often viewed as the persuasion of special interests. Conversely, essential research may starve for lack of public knowledge and understanding of its contribution toward achieving a better way of life for all. "Extension information" alone is inadequate for this purpose.

To be really effective an information programme must meet both types of needs. And to meet them effectively, the fact must be recognized that these needs are different and so require different approaches, different materials and, perhaps, even different organizations to carry out specialized programmes.

OUR COVER

Students at work in the bone room of the Veterinary College, Mathura.

It contains about 700 different kinds of bones of the animals concerned.

FARMER OF THE MONTH

MUQURRAB BEGUM

LADY FARMER OF BHESAKHEDI

AT last the 19 months old monopoly of the mere male has been broken. The feature *Man of the Month* has been dominated by the males since its inception and it is in the fitness of things that a lady now appears on the stage and takes her bow as the lady farmer of the month.

Muqurrab Begum is a lady of Bhopal, well known amongst agricultural circles as a progressive farmer who took over her father's estate, heavily loaded with debts some 15 years ago and made it into a first class modern farm. This farmer, who is also the village head woman, has 325 acres of land in three blocs situated at Bhesakhedi, Amla and Bhavri. Most of the land is under wheat, cotton and gram.

THE BEGUM TAKES OVER

On being asked who was responsible for getting her into this predicament, the Begum turned on me and said that she considered this a privileged position and would not give it up for anything. She told me that her father was a well known scholar and helped in compiling the Imperial Gazetteer and, as a scholar, had no interest in farming. Her mother had to look after the farm but found the task a little too much for her. The result was that Muqurrab Begum had to step in. It certainly was not an easy way to arrive at the position she occupies now. The farm was badly neglected. There was hardly any capital to meet day to day expenses and, what is more, there was no male relative on whom to rely. Not daunted by these difficulties, the Begum took over the reins of management and started personal supervision of all the chores on the farm. If there was any ploughing to be done, the Begum would be there. Nobody could start sowing unless it was under the Begum's eyes. As a matter of fact, she once had a foreman who charged the estate 8 maunds of seeds when actually he had used some 5 maunds. On discovering this, the Begum fired the man on the spot and decided to do everything

The Begum plans to clear every inch of her land

herself. By gradually marshalling all the resources and carefully planning her field operations, she wiped off all the debts and started on a programme of expansion. Whereas she started with a hundred acres of land, today she has 325 acres.

On being asked whether she could be considered a *jagirdar* in the true sense of the word, she retorted that had she been one she would have lost all her lands before now. She was a farmer first and last and all the land she has, has been acquired after sweat and toil of years.

THE DEVELOPMENT PHASE

In those good old days when father was engaged in compiling the Gazetteer and mother was trying to figure out whether to plough first or to look after the home, the yield was naturally nominal. By gradually toning up the land and through personal supervision, today this farm can boast of an average of 15 maunds of wheat per acre. One of the main problems confronting this lady was soil erosion and it was only after trying out crop rotation and paying attention to the correct management of soil that this problem has now been overcome. Attention has also been paid to water conservation and attempt is made to utilize to the maximum all the rains the fields get. The Begum does not believe in growing vegetables for marketing because in this area the vegetables are normally eaten away by stray cattle allowed to graze on open land—without any let or hindrance.

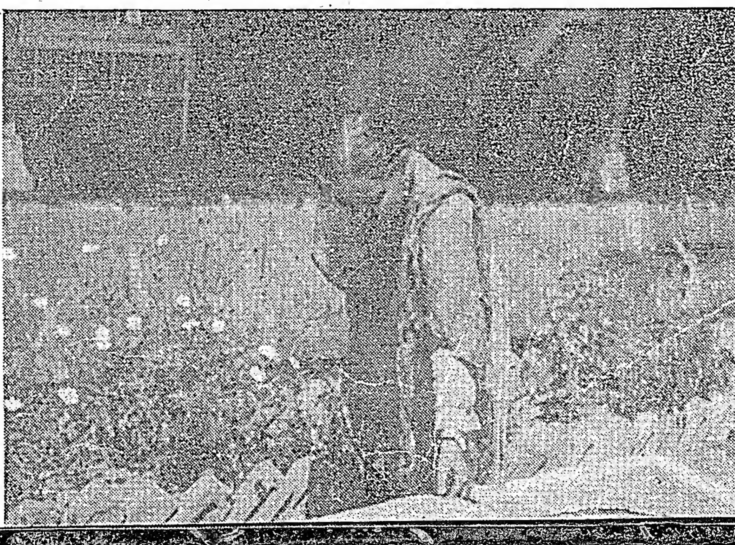
This year the lady has gone in for a tractor and has also made arrangements to provide for lift irrigation for the farm. By having complete control over all phases of field operations and by the virtue of her position as the village head woman, a certain responsibility has devolved on her shoulders. She has to act as a mother to the villagers and look after their welfare, act as their guide and generally be on hand to help them out of their difficulties. She also provides work for 20 villagers on her farm and is on very good terms with the peasantry in the area. She has taken on new land broken very recently, near Bhavri and plans to grow cotton to supplement her existing production. She is convinced that there are excellent opportunities for a self-reliant farmer and she praises the new techniques now being introduced by the local department of agriculture.

THE PROBLEMS

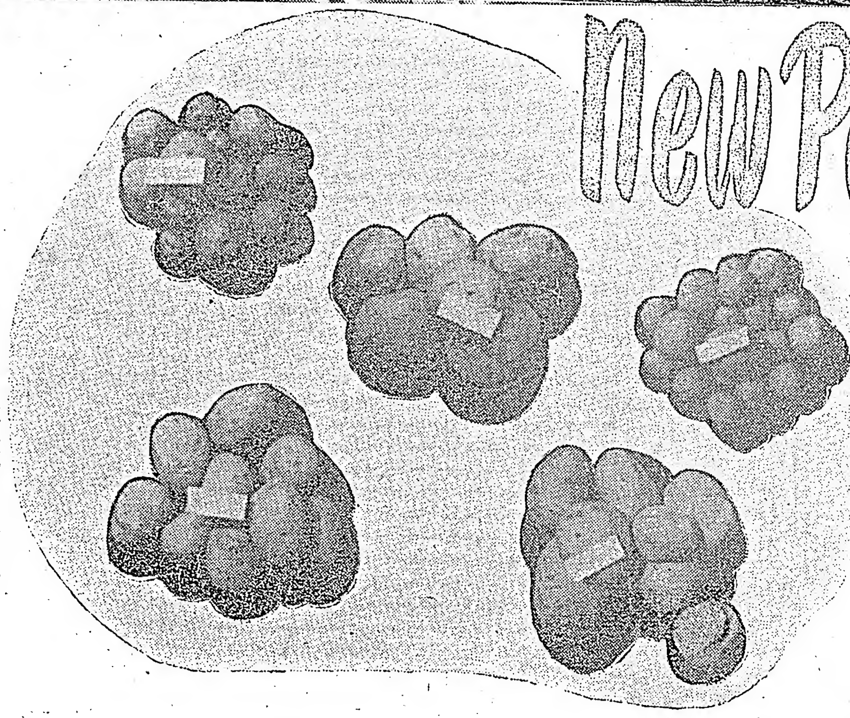
She wants good roads connecting the villages and feels that with the material help from the government and voluntary labour provided by the villagers themselves, construction of roads, bunds and minor irrigation works should not present any difficulty. She and her villagers are always on the look out for more land but in that particular area there is hardly an unoccupied acre. The result is they cannot expand. Another problem facing the villagers in the area is that of adequate irrigation but the development project launched recently has included Bhesakhedi and surrounding villages. This will no doubt lead to an all round improvement in the village conditions and will also

(*Continued on page 32*)

Examining the wheat



New Potatoes for Old



Top (left and right Darjeeling Red Round and Phulwa respectively Centre *and* below *New improved varieties*

By **M. J. DESHMUKH**
Central Potato Research Institute, Patna

FOR millions of people who live in the vast plains of India cultivation of hardly half a million acres of potatoes is indeed inadequate. One of the reasons for such low production of this useful commodity is the non-availability of suitable varieties which could profitably be grown under conditions prevailing in the diverse climatic and soil tracts of the plains. At present only four varieties, namely, Phulwa, Darjeeling Red Round, Gola and Up-to-Date are commercially grown in the plains under a plethora of colourful names. The first two varieties cover over 80 per cent of the area in the plains. The need for more and better varieties is thus obvious. Moreover, a noteworthy feature about potato is its sensitive response to climatic conditions which exert a profound influence on yield. Although a single variety may do fairly well over a wide range of area (as is the situation today), a variety particularly suited for a specific set of climatic conditions would do even better. Such regionalization of improved varieties is an important step towards maximizing the yields of this food crop. At the Central Potato Research Institute, Patna, a small team of workers is engaged in this persuit.

HYBRIDIZATION

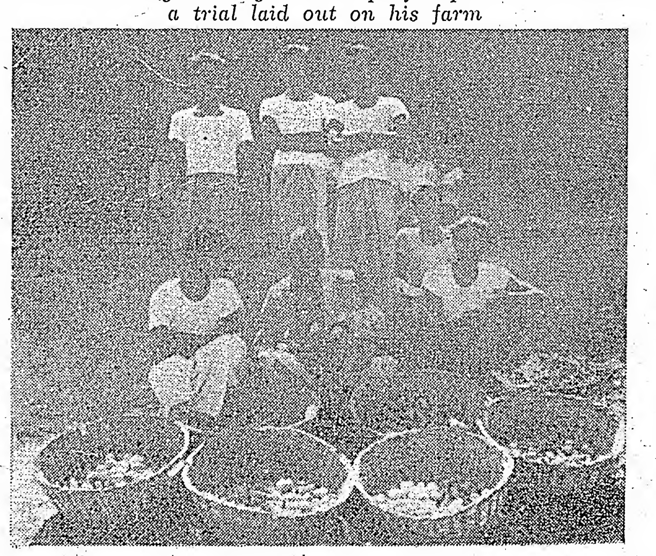
As a first step, a very large number of foreign commercial varieties and the wild relatives of potatoes from South America have been collected and are under close study with a view to judging their potential merits. Being foreign to our conditions the imported varieties are not suitable for direct cultivation. Efforts are therefore, made to incorporate desirable attributes of foreign varieties into the local types by methods of hybridization.

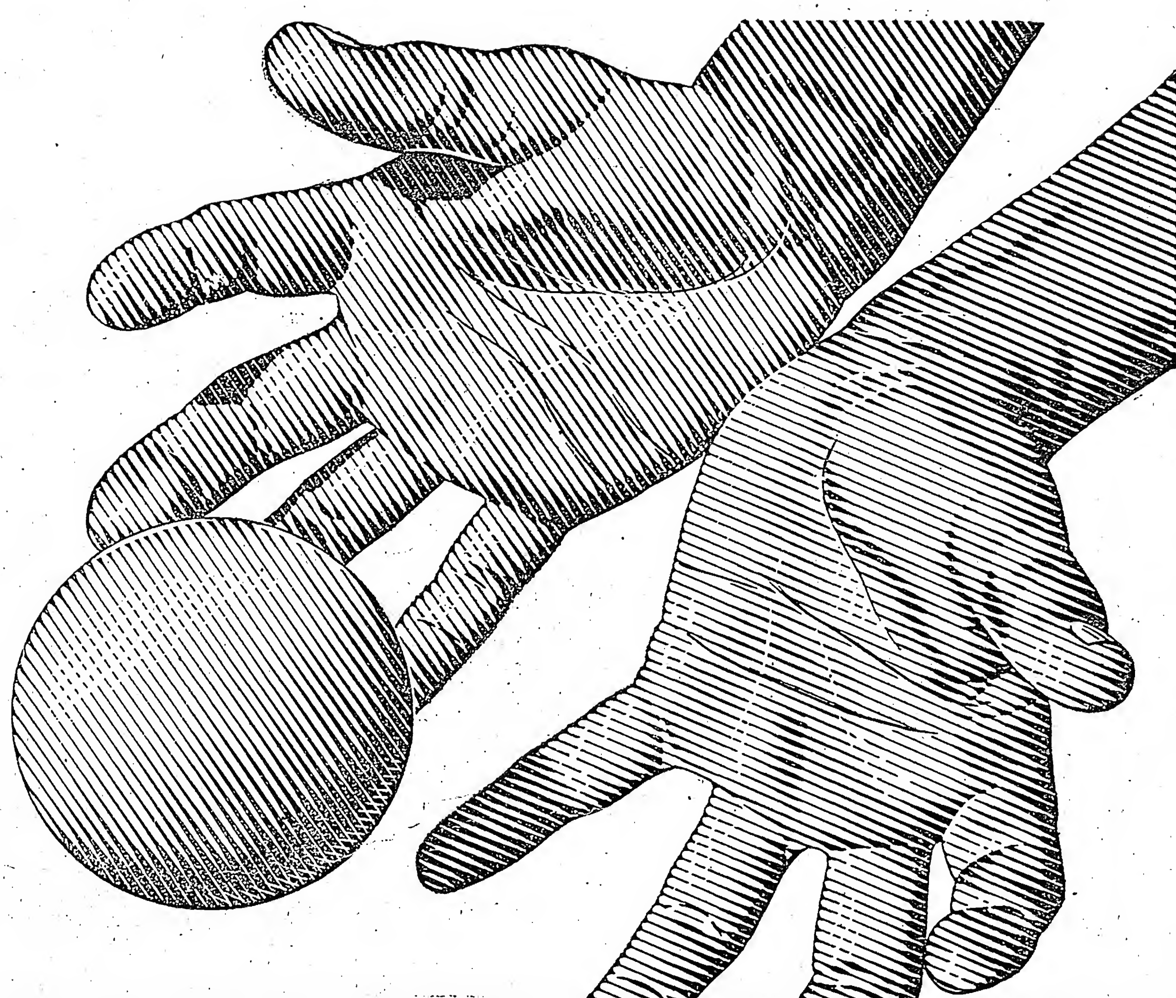
At the Institute's Sub-station at Simla (where potatoes, which fail to flower in the plains, flower profusely) crossing (mating) of suitable parental varieties is done in accordance with a planned scheme. The true seeds (which somewhat resemble the tomato seed) are carefully collected from grape-like fruits known

(*Continued on page 27*)

A family with its harvest of new varieties of potatoes

An educated cultivator from a village near Patna is happy to see a healthy and vigorous crop of improved varieties in a trial laid out on his farm





Hints to the farmer : Rabi Fodders

By

P. M. DABADGHAO, Indian Agricultural Research Institute, New Delhi

A good and successful farmer always makes adequate provision of fodder in his cropping programme for the feeding of his work and milch animals. He knows that due attention given to the feeding of his cattle more than repays him in terms of increased efficiency in agricultural operations leading to better yields and increase in the milk production. In this note I propose to describe some important *rabi* fodders with general hints on their methods of cultivation. These hints will be of use to farmers in their choice of fodder crops suited to their requirements.

Rabi fodder crops which are commonly grown in different parts of the country are berseem, lucerne, *senji*, *methra* and *shaftal* amongst the legumes and oats and *rabi jowar* among non-legumes. To this list may be added two less known but very useful crops, viz. rape and turnips. It may be emphasized that each of the above mentioned fodder crops has its own distinct useful character making it suitable for certain conditions as will be clear from the notes given below.

BERSEEM

Berseem (Egyptian clover) is one of the best *rabi* fodders in India, which is especially true on farms where the irrigation water is not a limiting factor. As its name indicates its original home is in Egypt from which country it was brought to India in 1904. Since then, its cultivation has steadily extended especially in the northern India where the climatic conditions are favourable for its growth. It is an excellent soil improving crop. It may be remembered that its introduction in rotation with cotton has been considered as epoch making in the Egyptian agriculture. Wherever conditions are favourable berseem should be the preferred crop.

Soil : It can be grown on all types of soils but best crop can be obtained on clay loam soils. It can also grow well on alkaline soils. In fact, berseem has been used for reclamation of alkali lands in Egypt.

Climate : The climatic conditions best suited for the optimum growth of berseem can be said to be those obtaining under north Indian conditions where the winters are dry and prolonged. As we go towards south the performance of berseem becomes less and less striking.

Time of sowing : The earliest sowing of berseem can be started by about the end of September and can be continued to the middle of November. If sown earlier, the seedlings are likely to be damaged by heat.

Preparatory tillage : It should be remembered that the seed of berseem is very costly and therefore due attention paid to the soil preparation will pay in terms of increased fodder production. The land should be ploughed 3-4 times, followed by beaming to bring it into fine condition. The land should be properly levelled and laid out in small 1/10th to 1/20th acre plots for facilitating irrigation.

Manuring : If grown on poor soils, 20 cartloads of well decomposed farmyard manure may be applied. Phosphatic manuring of berseem has shown very good results at this Institute and 2 to 3 maunds of superphosphate (triple) may be applied before sowing to get higher yields.

Seed rate : Eight to ten seers of berseem seed would be enough to sow one acre. It is advisable to use one to two seers more when the crop is sown early in September.

Method of sowing : The seed may be soaked in water for 10-12 hours before sowing. The land should be irrigated first and seed broadcast in standing water. The seed settles down on the soil and germinates when the soil comes back into condition.

Inoculation : Where berseem is proposed to be sown for the first time, farmers must use specially prepared cultures for inoculating the seed. Special culture for berseem, lucerne and other legumes can be obtained from this Institute. For using the inoculation prepare about 2 seers of 5% *gur* solution. Boil it a little to kill other bacteria. After cooling, soak the seed quantity required for one acre in this solution. Add the contents of the inoculum tin (which contains required bacteria sufficient for one acre) to this mixture and mix it thoroughly. Spread it under shade and allow it to get dry. Use this seed for sowing.

Failing this 2 to 3 maunds of soil from field, where berseem had been previously grown, should be broadcast in one acre of field intended for sowing berseem. It is to be remembered that it would not pay to grow berseem without inoculation.

Irrigation : When the crop is sown in September, the first 2-3 irrigations after sowing should be given at an interval of 4 to 5 days to establish the crop. But when sown at the normal time the first 2 to 3 irrigations should be given every 7-10 days depending upon the nature of the soil. The subsequent irrigations should be given at an interval of 15 days during winter and 10 days during summer.

Fodder : The early sown crop of berseem is usually ready for cutting by the end of November, while the normal crop is ready by the middle of December. The subsequent cuttings are usually taken regularly at an interval of 30 days or so. The yield is low in the

first cutting while the highest is obtained in the third and fourth cuttings. Six hundred to eight hundred maunds of green fodder is obtained in about five to seven cuttings. Under favourable soil conditions, adequate irrigation and judicious manuring of the crop yields as high as twelve hundred maunds can be obtained.

Feeding: Berseem fodder is soft, very palatable and rich in protein and generally does not cause bloating in animals fed on it except in the initial stages. As a rule, legumes being rich in protein content are liable to cause bloating in animals, the degree, however, differing with the type of legume. This effect is generally avoided if the quantity of legume fodder does not exceed about 30% of the total fodder fed to the animals and if hungry animals are not fed directly on it. Thus in the case of berseem, in the initial stages, the fodder should be mixed with three times its weight of *bhusa* and then fed. The proportion of berseem may be slowly raised so that in later stages the animals can be fully fed on it. However, in case of bloating a pound of linseed oil should be administered to the animal.

Berseem being rich in phosphate and calcium, improves the flow of milk of cows and buffaloes fed on this fodder.

Making of berseem hay: Excellent hay can be prepared from berseem which equals the clover hay of the temperate countries. At our Institute wire fencing has been very profitably utilized for hay making. The operation generally starts from the end of March. Berseem cut from the field is spread on the wire fence, is turned once or twice and within a week's time excellent hay results.

Alternatively the fodder may be spread on ground in a thin layer. The stuff should be turned once after a day or two before the hay gets brittle.

Seed production: Seed production of berseem is a paying proposition and in order to improve the receipts of the farm it would be desirable to keep a portion of the field for seed purposes. The crop, in this case, is not cut after the middle of March. Frequent irrigations are necessary during flowering and seed setting stages. Seed is generally ready by the end of May or the beginning of June when the crop should be harvested for seed purposes. The crop should be threshed as thoroughly as possible by bullocks. Unless thoroughly threshed there is always the possibility of losing a good deal of seed. Three to four maunds of seed per acre may be considered as a fairly good yield.

LUCERNE

If berseem is a high yielding annual fodder legume, lucerne is a perennial one with the same attributes. It is capable of producing successive cuttings of fodder for 5 to 7 years, once sown. It is fitly called the king of fodders in countries where cattle industry is very much advanced. Once established it is a continuous source of fodder supply throughout the year. The fodder is very much liked by the cattle, especially the horses.

Climate: Lucerne is well adapated to wide climatic variations. It gives best results in cooler climates with about 20-25 ins. rainfall. The crop is adversely affected by extremes of heat and cold in dry regions and heavy rains in humid tracts.

Soils: It can be grown on a variety of soils from sandy loam to clay. It grows best on well drained deep soils of good fertility. Waterlogged and highly alkaline areas should be avoided.

Preparatory tillage: Like berseem, the seed of lucerne is also very costly and since it is a perennial crop, extra care must be taken to see that a fine seed bed has been obtained.

Manuring: If lucerne has to be a paying crop, regular and heavy manuring must be considered a necessity. About 15 to 20 cartloads of well rotted farmyard manure should be applied per acre, at least six weeks before the sowing. This should be thoroughly mixed with the soil. Application of 2 to 3 maunds of ammonium phosphate every year as a top dressing would give profitable returns.

Seed rate: Seed rate generally varies with the method of sowing. Ten to twelve pounds of seed per acre would be required when sown by drilling or on ridges but 16-20 lb. would be required when broadcast.

Time and method of sowing: The best time of sowing lucerne is from the middle of October to the middle of November. Three methods are generally followed for sowing lucerne. The common method of sowing is by broadcasting of the seed in a moist seed bed. The seed is also drilled in lines, one foot apart. These methods can best be followed on light soils. Sowing on ridges $1\frac{1}{2}'$-$2'$ apart have been recorded to give best results on heavy soils as in Bombay State. When sown on ridges, the seed is sown $\frac{1}{2}$--1 in. deep on the top of the ridge and the land is immediately irrigated taking care that the water does not overflow from the top of the ridges. This method involves less quantity of irrigation water. The crop can also be kept clear of weeds.

Inoculation: It is not only for berseem and lucerne that inoculation is necessary but this applies almost to all legumes. The use of inoculum has already been referred to in connection with berseem.

After care: When sown on ridges the first two or three irrigations should be given at an interval of 5 to 7 days. The subsequent irrigations may be given at intervals of 15 to 20 days during winter and 10 to 15 days during summer. The crop may be hoed from time to time for removing the weeds as also to open up the soil.

Fodder cutting: The first cutting is generally taken after $2\frac{1}{2}$—3 months of sowing. The yield in the first cutting is low. The subsequent cuttings can be taken at intervals of 5 to 6 weeks depending upon the fertility of the soil and irrigation. Six to eight cuttings, can usually be obtained. The fodder is mostly obtained during winter but under Delhi conditions it gives a fair amount of fodder even during summer and to some extent even during monsoon, yielding 500 to 600 maunds of excellent green fodder per acre per year.

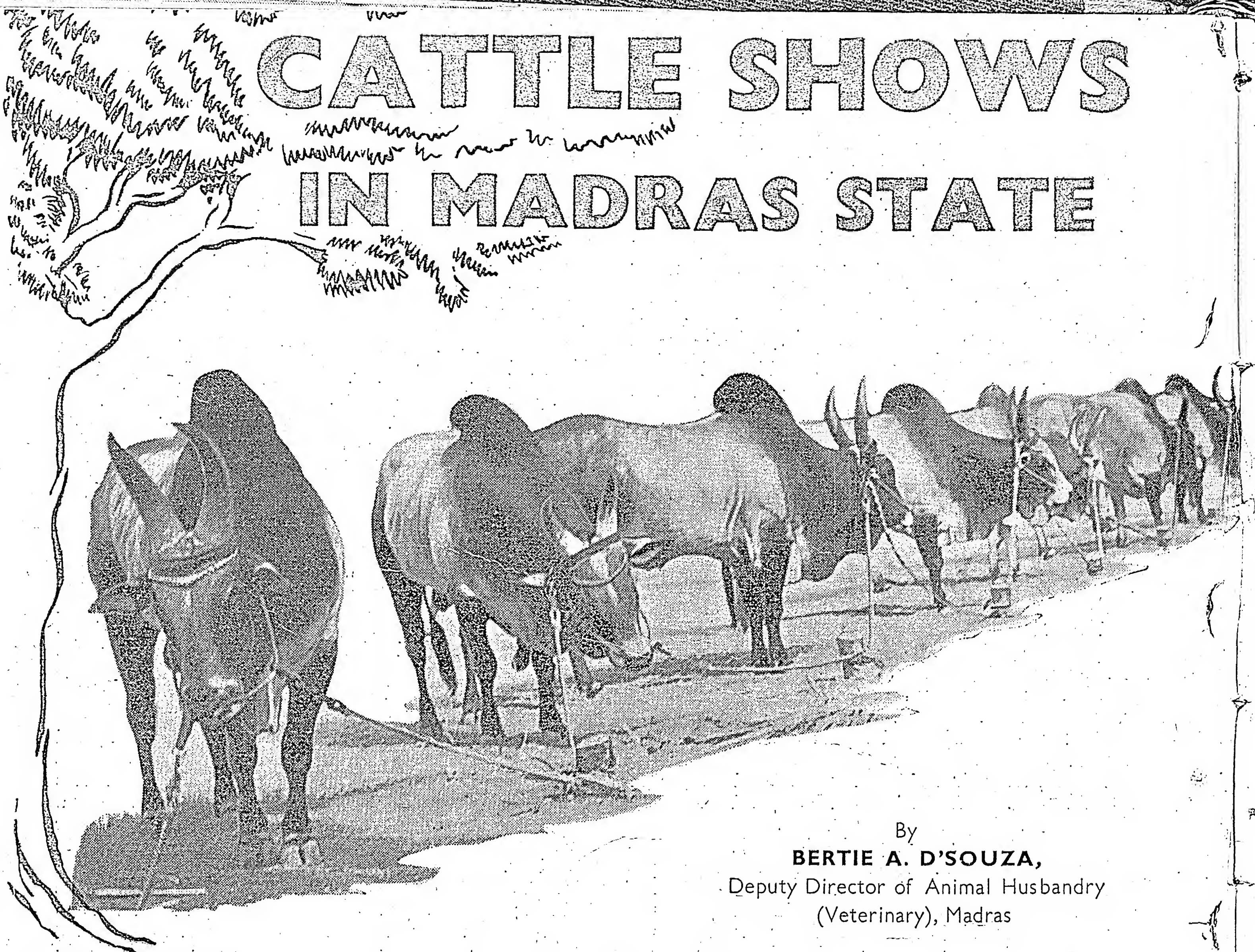
Feeding: The lucerne fodder is highly nutritious and palatable. It is specially favoured by horses. Because it causes bloating, lucerne, in some parts, is not recommended. This effect, discussed under berseem, is generally avoided if quantity does not exceed about 30% of the total fodder fed to the animals and if hungry animals are not fed directly on it. Further, if the fodder is cut at the flowering time and allowed to dry in the field for some time before it is fed to the animals the chances of bloating are much lessened.

Making of lucerne hay: It is advantageous to feed animals on lucerne hay as the bad effect of bloating is avoided to a very great extent.

Seed production: The seed production in lucerne is rather low. When required for seed, a portion of the field

(*Continued on page 30*)

CATTLE SHOWS IN MADRAS STATE



By
BERTIE A. D'SOUZA,
Deputy Director of Animal Husbandry
(Veterinary), Madras

IN the sphere of development of livestock in Madras State, the Animal Husbandry Department has done a great deal to bring about improvement in the well recognized breeds of livestock. The schemes like the premium, the Government bull distribution and the District Board Schemes together with the departmental farms, one-day cattle shows, Taluk and district cattle shows have all gone a long way in making the farmer realize the importance of the proper maintenance of animal health.

No one will dispute the importance of the *ryots* in any scheme of livestock development. This is well appreciated by the Department and the cattle shows have served as a means to fostering among them the needed enthusiasm for livestock improvement which they have been lacking hitherto.

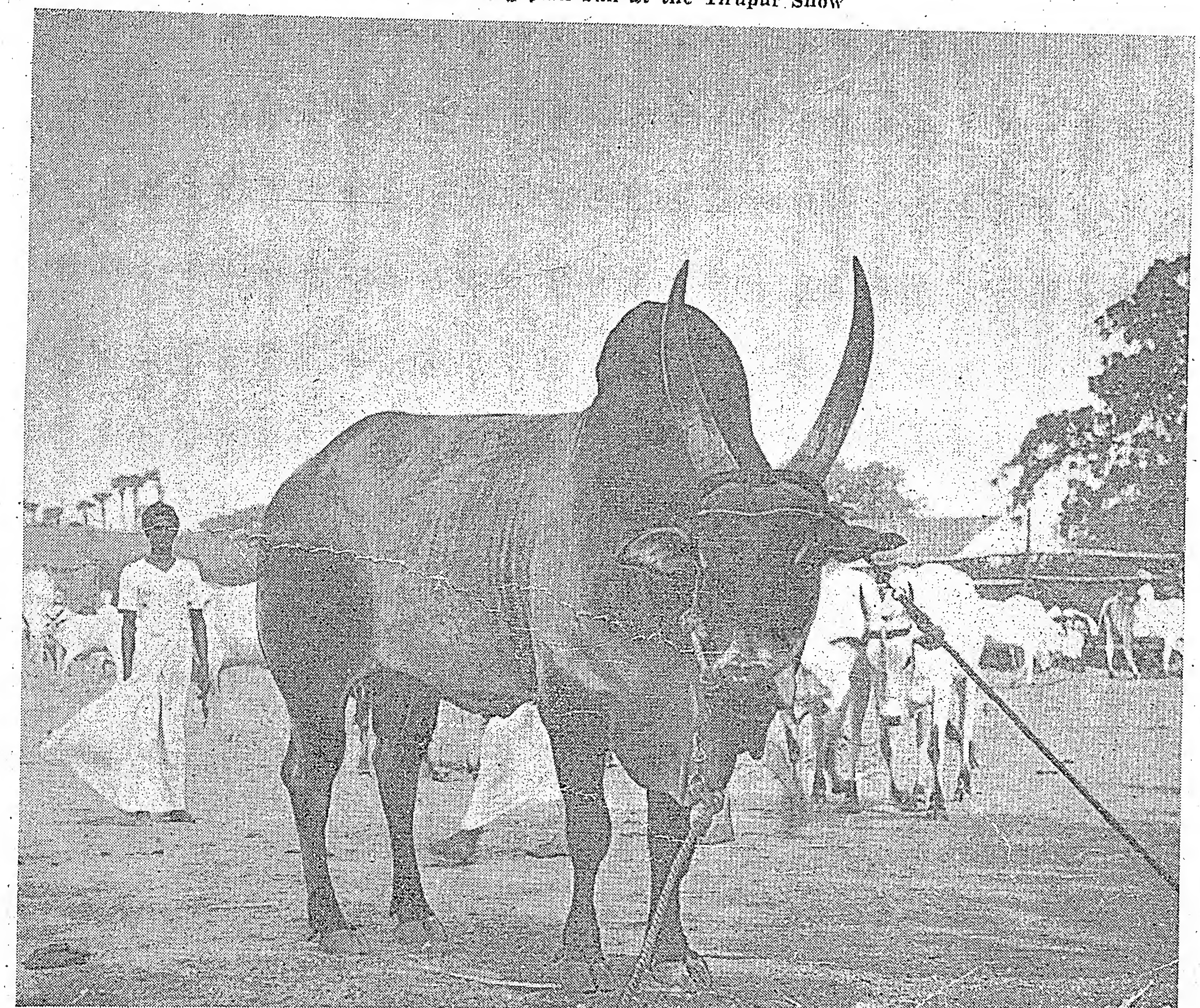
For the purpose of establishing and developing the well-known breeds of cattle like Kangayam, Ongole and Hallikar, the State has been differentiated into zones, one for each breed, where the pure breeds are multiplied through selective breeding. Thereafter, the breeding operations are extended to the other zones. Similarly the sheep and poultry development in the rural and urban areas has also received adequate attention.

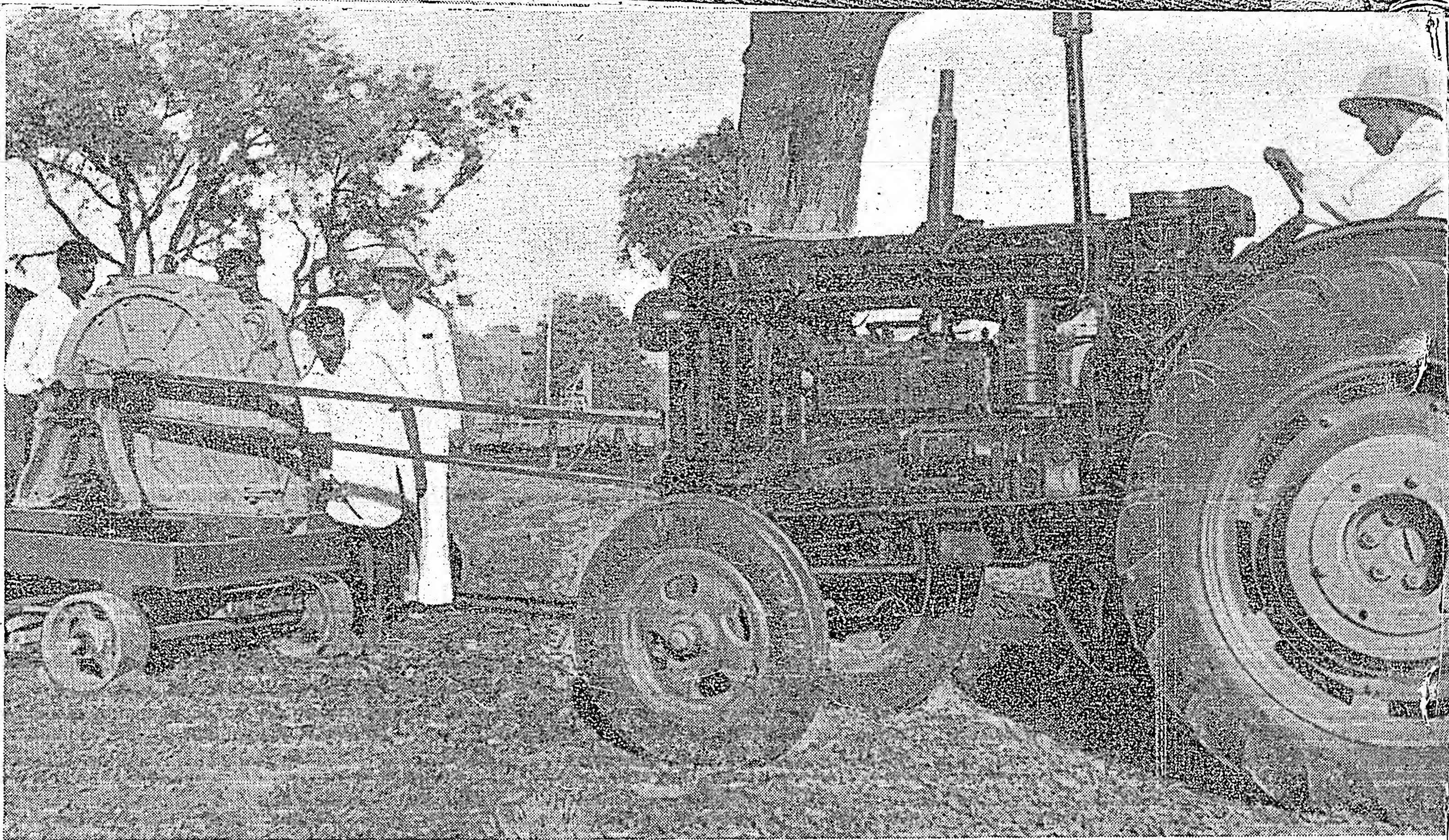
In the breed zones all help and encouragement is given to maintain pure breeding bulls. Stud bulls are released from the Government farms, for this purpose. They are also selected from private breeders and are maintained at suitable centres, care being taken to enforce continuity of breeding operations for a certain period. Over 1687 breeding bulls are at stud in the State at present and the impression these bulls make on the rural livestock is periodically assessed at the various cattle shows organized by the Department, which is a significant feature of the department in livestock development. The number of recognized breeding bulls available in the State is far less than its requirements. It is, however, anticipated that with the speedy establishment of a network of artificial insemination units in the State, the cattle breeding programme will gain in momentum.

These cattle shows contribute a great deal to the knowledge of the breeder regarding breeding of the right type of animals. The prize winning animals at these shows have undoubtedly served as a guide for the cattle breeders to attain that ideal. Pride of ownership has also helped eliminate bad features from the stock, and the comparative study at these shows has been an education in itself. As a result many diseases have been eliminated altogether. Over 15 contiguous southern districts of the State have been free from Rinderpest for the last five to eight years. Day by day these shows are gaining such importance that if they are not held after long intervals they shall be the best sale-display ground for high class cattle. The Tirupur cattle fair and show attracts a large number of good Kangayam cattle and, in effect, has come to stay as the best sale-display ground for this breed.

Sixty-two cattle shows were held during 1951-52. A sum of Rs. 200 for each show was given by the Department in the shape of prizes besides a large number of awards received as donations from the general public. Apart from these departmental shows, 15 private cattle shows were also held, to each of which the Department lent its support by granting a sum of Rs. 100 in prizes. These private shows are of recent origin and augur well for the cattle breeding industry of the State. (H.K.S.).

The best Kangayam bull at the Tirupur Show





BONE-MEAL AND ITS MANUFACTURE

By **G. R. VALUNJKAR,**
Bone-Meal Adviser to the Government of India, Ministry of Food & Agriculture,
New Delhi

PHOSPHATES are of vital importance to the animals and plants. Animals receive their supply of phosphates from the plants which they in turn have absorbed from the soil. Some of the intake of phosphates by the animals finds its way out of their bodies through solid and liquid excretions, while a part of it is retained by them for bone formation. In the absence of the discovery of appreciable quantities of rock phosphates in the country, bones are the only indigenous source of phosphates for the Indian soils. In order, therefore, that the life processes in plants be carried on unhampered and the animals should get their regular supply of phosphates from them the bones of the dead animals should be returned to the soil.

Phosphates in their natural condition are not water soluble and, therefore, the plants cannot absorb them. However, when treated with acids, they become soluble. In recent years, superphosphates have been produced in factories by treating natural phosphates with strong acids. But, the soils which are by nature acidic respond better to the application of raw phosphates than superphosphates. When applied to the soil they enable the plants, especially those with fibrous roots, to develop a more extensive root system.

BONE-MEAL

From the commercial standpoint, bones are classed as fresh and sun-dried or weathered bones. Fresh bones are rich in organic substances such as tallow, glue, gelatine, etc. while sun-dried bones abound in rich inorganic substances like calcium phosphate which is the main source of phosphatic manure.

The fresh bones from the slaughter houses are chopped for the extraction of crude tallow which is later refined for use in the soap and textile industries. The degreased bones from the tallow extractors are next treated with hot water and steam to separate bone glue. The material remaining after removal of the glue is in a fit condition for the manufacture of bone-meal. The bones from the extractors are ground to a fine powder, to give the so called 'steamed bone-meal'. This product is a valuable fertilizer although its action is slower than superphosphate. This is due to the fact that the combined phosphoric acid in steamed bone-meal is not in a water soluble form for quick action as in superphosphate, but is only gradually available to plants according to the acidic conditions present in the soil.

SUPERPHOSPHATE

Instead of manufacturing bone-meal, which is a slow acting fertilizer, degreased bones can be converted into rapid acting superphosphate by treating them with sulphuric or any other acid. This is done in mechanical mixers of which quite a few have been successfully operated. The quantity of ground bones, the quantity of acid of a particular strength and the period of mixing have all been standardized with a view to obtaining a superphosphate of uniform grade, viz. about 20-21 per cent of water soluble P_2O_5. A single mixer of the Steadman type will produce daily about 15 tons of superphosphate. Superphosphate of similar quality can also be prepared commercially in factories by utilizing the dried bones available in markets.

DOUBLE AND TRIPLE SUPERPHOSPHATE

Superphosphates containing more than 30 per cent soluble P_2O_5 are commercially known as double and triple superphosphates. In order to produce this type of compound, it is necessary to first prepare crude phosphoric acid by the action of sulphuric acid on bones and then to treat the acid so obtained with a calculated amount of bone phosphate. The compound thus obtained is a concentrated fertilizer and, therefore, fetches a much higher price than ordinary superphosphate.

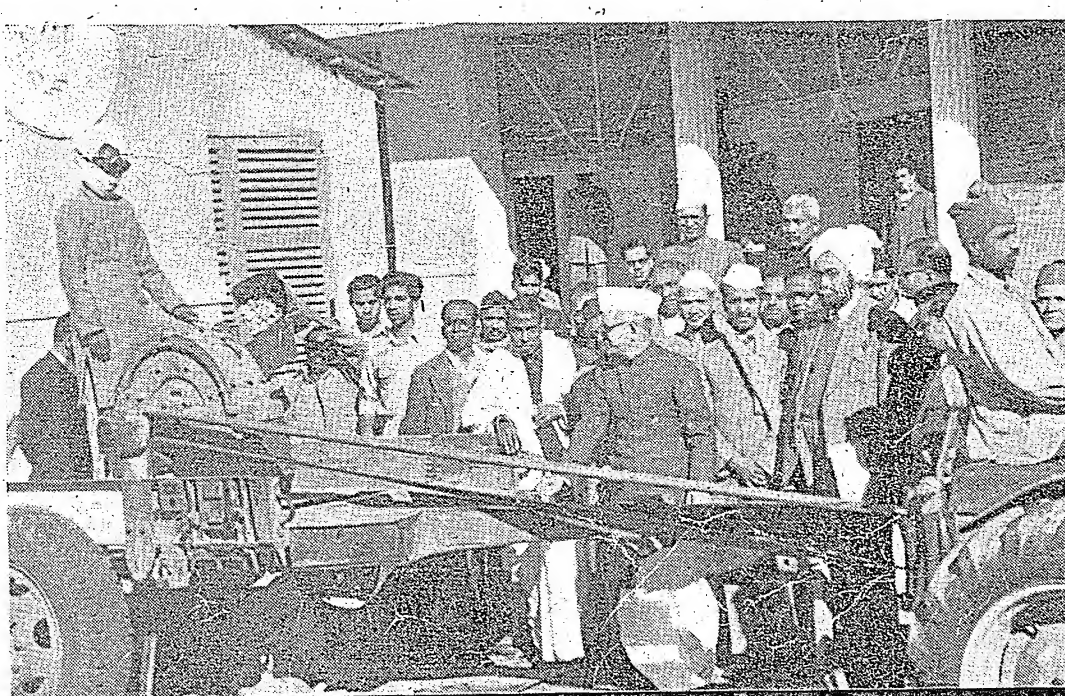
RAW MATERIAL

The total potential production of raw bones as worked out from the mortality of cattle and other animals, slaughter house figures and other sources works at about 4-5 lakh tons per year. Although it may not be possible to collect all these bones still, if the collection is organized on proper lines, it may be possible to procure something like 3 lakh tons of bones per year. The yearly collection so far has not gone beyond 1½ lakh tons in any year. The reason is that it does not pay to collect bones from places more than 50 miles away from a railway station on account of increasing transport charges. The bones in the interior of the country thus lie uncollected. If the efficiency of the bone-meal manure is made known to the agriculturists through propaganda and demonstration, the consumption of bone-meal would get a stimulus and the factories in the interior will have a ready local market. This local production and consumption will save transport charges, eliminate intermediate agencies and turn out cheaper bone-meal without harming the interests of the primary bone collector. If through local demand small economic units are established each within a radius of say 30 to 40 miles, the collection would increase sufficiently.

BONE CRUSHING

The present bone industry in India is limited to bone crushing only. Bones are crushed by mechanical means and bone grist is exported to other countries after retaining about 25 per cent to meet internal manurial requirements. As these crushers are interested in the export trade only, they find it convenient to establish their factories near the ports. The bone crushing factories that consume about 75 per cent of the present bone collection in the country are, therefore, situated in Calcutta, Bombay, Madras, Jamnagar, etc., the highest concentration being at Calcutta. As such they do not find it economical to get the available bones collected from the interior. It is, therefore, advisable either to decentralize the industry and encourage the establishment of small power crushing units of the crushing capacity of say 500 tons per year or get the bone-meal prepared on village industry basis without the use of mechanical power. The latter experiment was tried by the Madhya Pradesh Government under the supervision of the writer for two years in 1938-40 but the response at that time was negligible. The reason might have been that the margin of profit from a hand pounding small unit was not sufficiently attractive to new entrants in the line. When the question was again taken up by the Madhya Pradesh Government in 1946, the writer suggested the encouragement of small power crushing units which might ensure to the new entrant a net income of about Rs. 5,000 per year. This time the response was encouraging. There are at present some four bone crushing factories working in the State with

A demonstration of the working of a new mobile plant for crushing bones, manufactured in India



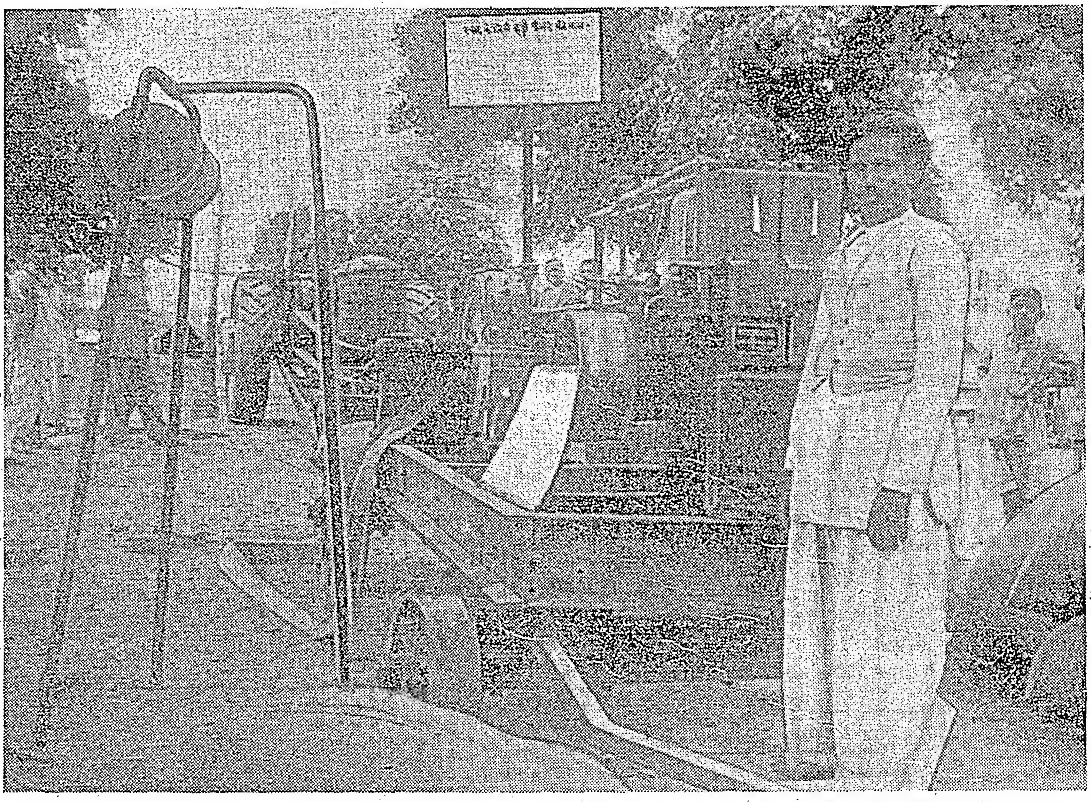
a total crushing capacity of about 10,000 tons per year, while there was none in 1938-39. This has opened up a new avenue of work for men of limited means and many people are coming forward to take to this industry. Sufficient encouragement and protection from the Government is, however, still needed. The response from other States during the last three years has also been encouraging.

METHODS OF BONE-MEAL PREPARATION

Use of a disintegrator : For a small unit of about 500 tons crushing capacity a 22—30 in. size disintegrator, worked by an oil engine or electric motor of 15-25 horse power can be used. Fairly good disintegrators of these types are now being manufactured in India and the low horse power oil engines or electric motors of Indian make are also available. The total expenditure on land, sheds and the plant should not exceed Rs. 15,000 after allowing for a small working capital for the purchase of raw material, etc. The crushing charges of such a unit will come to Rs. 30-35 per ton if all the bones were crushed into bone-meal, and not 75 per cent bone grist and only 25 per cent bone-meal, as is being done by the existing big factories.

The charring method : For taking up this work on village industry basis the charring process is recommended. This method was used at Wardha. No special kind of apparatus or plant except a village *dhenki* to pound the bones after charring is required. Charring is an inexpensive and simple job and can be done in an hour or so with waste straw or fallen dry leaves. The cost of crushing by this method would come to about Rs. 55 per ton including the pay of a manager at about Rs. 100 p.m.

The cooking method : The method of cooking the bones in a digester was demonstrated by Baba Chetandas at Pusa. The bones when cooked become soft and can be easily crushed without the use of any mechanical power. A digester of the required size to cook the bones and a village *dhenki* to pound them after cooking is all what is required. Indian made disgesters of this type are not available at present. The imported ones of about one hundredweight capacity may cost nearly a thousand rupees each. The crushing charges according to this method would come to about Rs. 100 per ton inclusive of other incidental charges.



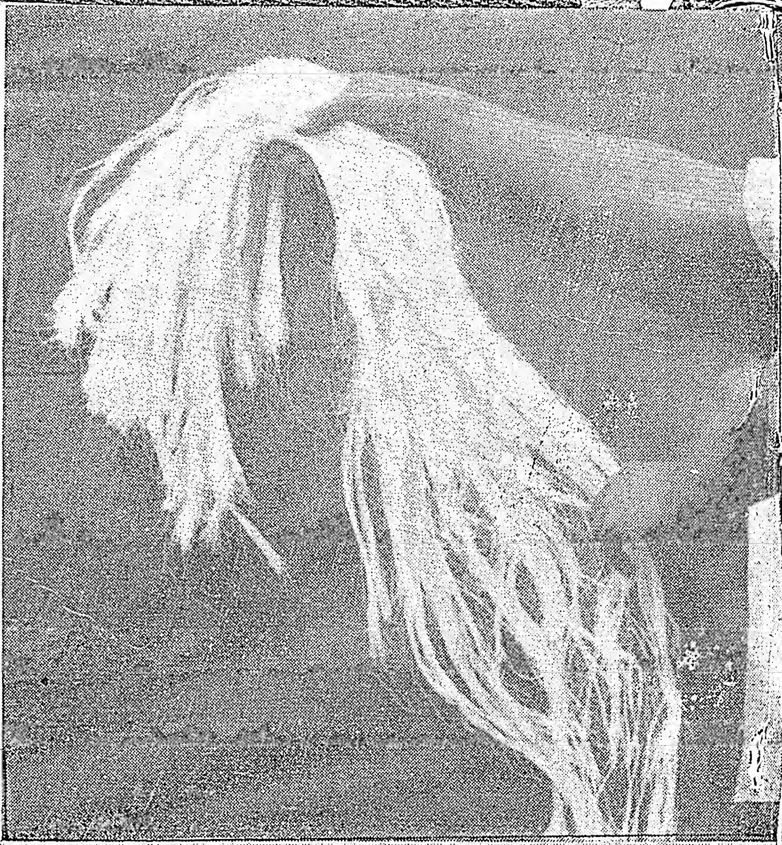
The first experimental working of a mobile unit in a cattle show exhibition at Lucknow during February, 1950

Bones when charred or cooked lose weight and some nitrogen and we get only 70 per cent bone-meal with about half the nitrogen of the raw bones. These losses add to the cost of the finished product.

The mobile unit : An ordinary disintegrator of the desired size is mounted on a trailer which can be driven from village to village by a tractor of the required horse power, say, 25. The disintegrator can be worked by the same tractor to crush the bones. After crushing, the bone-meal necessary for the locality may be kept at the village depot and the surplus carried in the same trailor to the central depot for further disposal. Such a unit may cost about Rs. 10,000. It can crush about 500 tons in a year and the crushing charges according to the experiment carried out at the Indian Agricultural Research Institute worked out at Rs. 32-38 per ton for complete crushing of bones.

Bones crushed in raw condition do not lose any weight or nitrogen if these are perfectly clean. The loss due to uncleanliness or adulteration is a common factor in all the processes. (H.K.S.).

FIBRES from RAM-BAN (AGAVES)



A thick hedge of 'Ram-ban'

By

S. M. WAKANKAR,

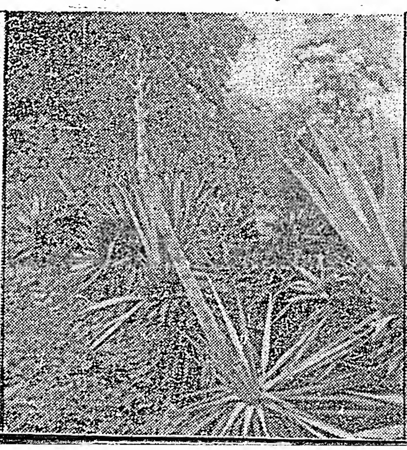
Economic Botanist to Madhya Bharat Government, Gwalior

AGAVES commonly found as hedge plants around gardens and fields are known as 'ram-bans' in northern India. They are conspicuous by their thick fleshy long dark green leaves having a spiny tip and spiny margins. The growth of the plant is made all the more conspicuous by whorls of crowded leaves which make it a very useful hedge plant.

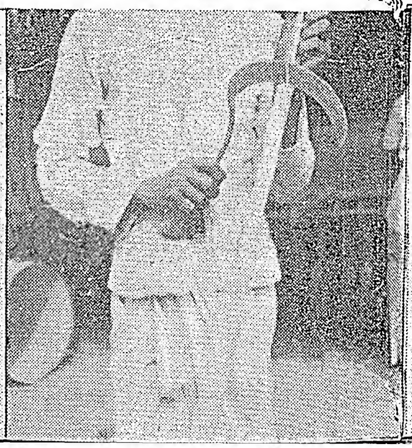
'Ram-bans' will grow on any soil under a wide range of rainfall ranging from 20 to 60 ins. The fibres are good on poorer soils with rainfall between 30-40 ins. On richer lands with heavier rainfall the leaves tend to become more fleshy which reduces the proportion of fibre. Its propagation is very simple. It is done by means of suckers and bulbils which are in fact small plants borne on the pole which is the flowering stalk. Poling occurs after 10-15 years only once in the life of the plant, after which the plant slowly dies. The suckers which are developments of the roots are produced after 3-4 years for nearly five years. The suckers and the bulbils can be planted directly in the rainy season in the fields or on the borders of gardens and fields.

Poling. Note the bulbils on the top of the pole. From the adjoining plants leaves have been cut to extract the fibre

First the tip is cut and then the spines along the margins of the leaf are removed by sickle



Fibres are extracted by the fibre-extractor



They grow exceptionally well if planted on embankments or raised ridges. Bulbils are commonly found during rainy season. Suckers and bulbils can be planted in nursery and later on can be removed for replanting.

It is as a hedge plant that 'ram-bans' can mainly be recommended in northern India. It makes a very efficient hedge plant and its strong spiny leaves are a strong barrier against cattle trespassing.

The leaves of 'ram-bans' at present are mainly used for tying sheaves of harvested wheat and gram. They can more profitably be utilized for extracting fibre by the cultivator in his hours of leisure and to put some extra money in his pockets as also to supply the much needed cordage and ropes in his day to day agricultural work.

The leaves can be cut for extracting fibre 4-5 years after planting. About 20-25 leaves can be cut during the rainy season when the cultivator is free from his field work. There are two methods of fibre extraction, viz. dry and wet. It is the dry method which is simple and is being described for the benefit of small cultivators.

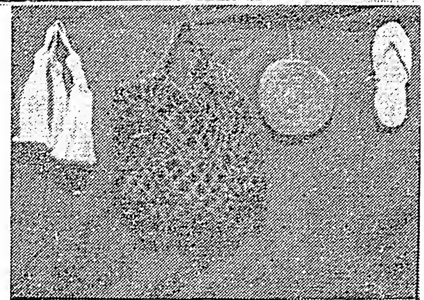
The dry method is mechanical. The man who extracts fibre should smear both his hands with oil as the sap irritates the skin. First the tip of the leaf which has a spine is cut with a sickle and later both the margins are 'cleared off' of the spines. The leaf is then divided lengthwise into 4-5 strips one end of which is fixed in a clamp about $4\frac{1}{2}$ ft. high. This allows the worker to extract fibres in a convenient standing position. The soft tissue is removed by means of a fibre extractor. It is a pair of tongs which is just like the simple nail puller but with broad $1\frac{1}{2}$ in. wide serrated clasping edges which separate fibre from the adhering soft mealy tissue. The fibres can be dried directly in the sun and if they are not free from the adhering matter can be washed in water before drying.

The length of the fibre is usually 2-3 ft. depending on the length of the leaf. Tender leaves should not be used as the fibre will be weak and percentage of extraction low. Similarly, old cracked leaves should be avoided for they yield short coarse fibre. The percentage of extraction of dry fibre by the above dry method is 4% of the fresh weight of the leaf. The fibre is shining white when extracted by the method described above.

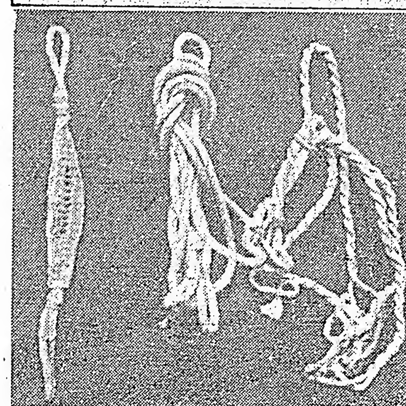
The fibres after drying are twisted into thin strings by a wooden country spindle locally known as 'dhera'. The thin strings are then twisted into ropes of varying thickness. Ropes made from 'ram-ban' fibres are stronger than coir, cotton and *ambadi*.* They last long and are useful for all agricultural purposes like head ropes for bullocks, tying plough parts, use in bullock carts and water lifting appliances.

'Ram-ban' fibres take excellent bright colours. They dye well. They can be used for preparing door mats, bags and sandles in addition to the usual cordage.

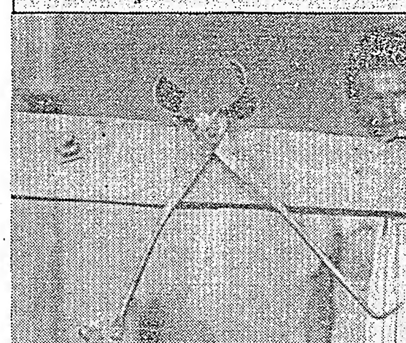
* 'Ambadi' or 'Pat-San' is *Hibiscus canhabinus*.



Brushes, handbag, 'niwar' and sandle made from the fibre

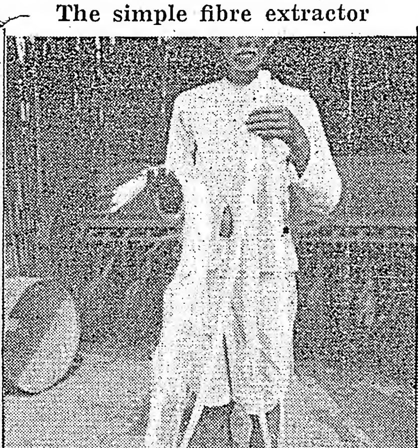


Ropes and the neck band for yoking the bullocks



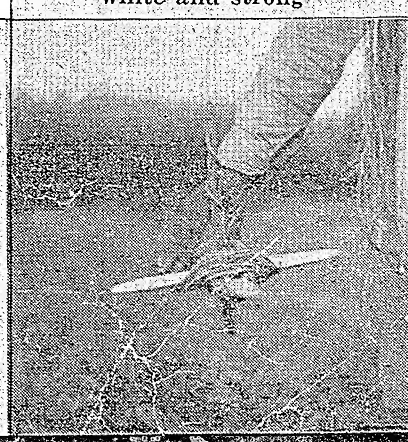
The local 'dhera'. Fibres are spun into thin string

The simple fibre extractor



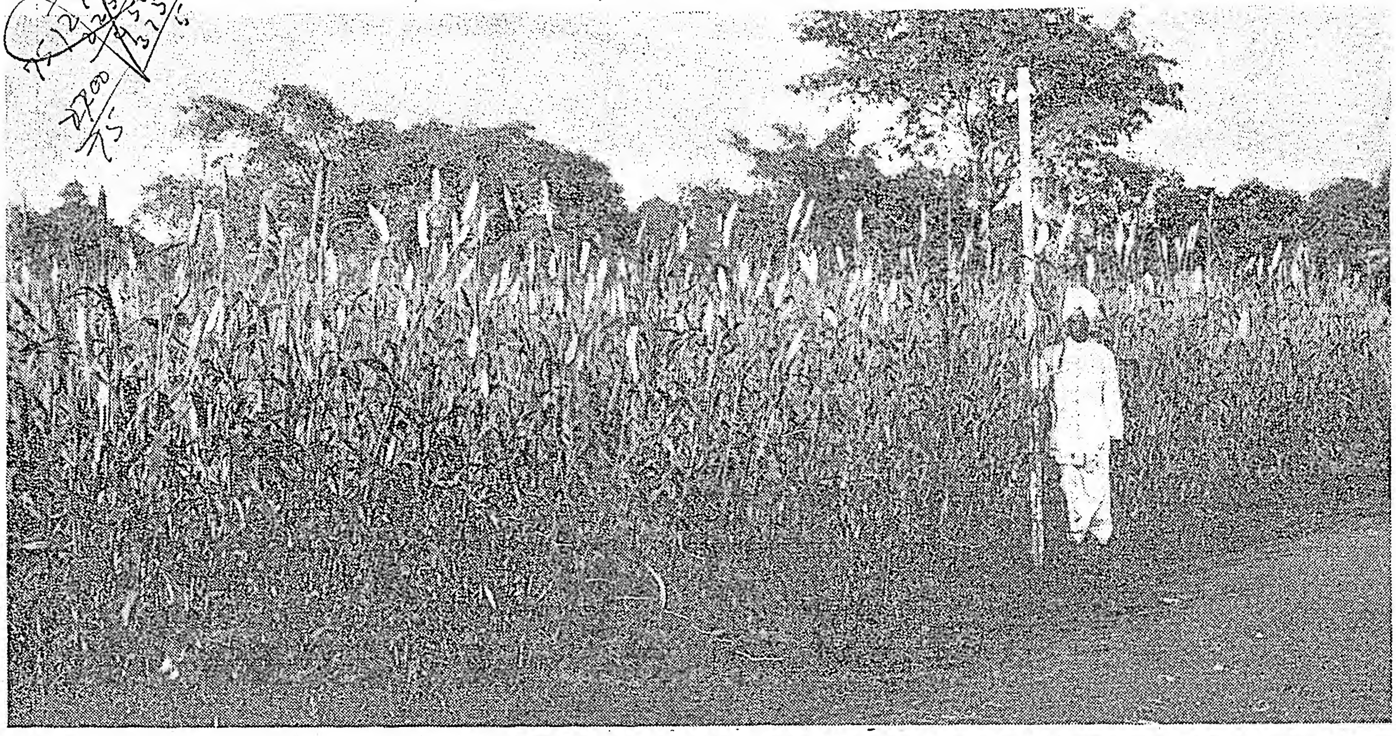
Leaves and the fibres

The fibres are neat, shining, white and strong



HOT WEATHER BAJRI

By **H. M. DESAI**



IN the Kaira district the hot weather Bajri crop is usually grown to an extent of $2\frac{1}{2}$ lakh acres which rise to about 3 lakh acres in a scarcity year. Usually the hot weather crop is grown along with Sudhia fodder Jowar crop, either on wells or lift irrigation on river beds. The area under these crops has risen in recent years after the advent of oil engines and pumps which are about 3000 in the Kaira district of which about 80% are in the Charotar tract alone. The Charotar tract comprises roughly of Anand, Borsad, Petlad and part of Nadiad Taluka of the Kaira district.

Some of the pump owners are cultivating their farms themselves, and being enterprising and progressive farmers, experiment themselves to obtain the maximum production by daring trials. Results of trials of the most of such farmers go unnoticed and with the wane of enthusiasm or due to change in cropping in the next year the continuity of the trial is lost. We have no organized leadership in a village to bring the results of such trials to notice of the other farmers through the agricultural department or the press or by some other means. Our local press in original is indifferent to earth out such information and publish as news. Whenever such information comes to the notice of the district staff of the Agricultural Department they hold a demonstration to bring the results to the notice of other farmers round about and the matter rests there.

A fine example of such an enterprise has come to our notice through the good office of the District Agricultural Officer, Kaira district, Nadiad, which is recorded here for the general information of the farmers.

Mr. Girdharbhai Motibhai Patel of Keriavi of the Nadiad Taluka who is a big landlord himself, cultivates about 75 *bighas* of land under the pump irrigation. This year in the hot season he laid out a trial of his own in one acre of area to get the maximum yield of summer Bajri. As a result of trial he obtained 133 maunds of Bajri grain, i.e. 5320 lb. and 2700 bundles of fodder from one acre. This is really a very good yield and roughly can be taken as 3 to 4 times of ordinary hot weather Bajri yield and about 6 to 7 times the good Bajri yield in the monsoon season. The treatment of the crop was as under :—

(*a*) PREPARATORY TILLAGE

The previous crop was Kodra mixture which was not manured. The land was manured at the rate of 100 cartloads of F.Y.M. in the cold weather and was ploughed 5 times with a country plough to thoroughly mix the manure.

(*b*) SOWING

Land was irrigated prior to sowing, which was done on Maha Sud 15, i.e. the 10th February, 1952, at 18 ins. apart both ways after marking. At each place about 4 to 6 seeds of local variety of Bajri were dibbled which were thinned to about 2 to 3 plants at a dibble after germination. The seed rate used was about 4 lb. per acre. After dibbling, the land was laid into long beds (60′ × 12′) for facilitating irrigation.

Germination was complete in about a week's time.

(*c*) AFTER-CARE

After germination the first irrigation was given after about three weeks. Subsequent irrigations were given at 8 days' interval except the last three, which were given at 4 days' interval. A week before harvesting the irrigation was stopped. In all 14 irrigations were given. The crop was intertilled 4 times and planked once to encourage tillering.

(*d*) Growth

Plants were about 8 feet in height and put forth on an average about 25 tillers per dibble while 80 to 100 tillers at places were not uncommon. It may be specially noted that tiller heads were very poorly filled and many of those were empty. Central short heads were about 9 ins. in length and well filled in. No pest or disease was noticed.

(*e*) Harvesting

The crop was harvested by the middle of May (i.e. 3 to 3½ months after sowing) and yielded 133 maunds (40 lb. each) of grain and 2700 bundles. Grain and fodder quality of the crop was good.

In discussion the following facts emerged:

(*a*) The local variety, which is a monsoon variety and is sown in the hot weather also, is not a suitable variety for the latter season. A variety for hot weather is required to be evolved with tillering habit in which the tillers will fully develop and yield grains.

(*b*) The hot weather Bajri field should be manured in the preceding monsoon season so as to get the full advantage of the farmyard manure. If the hot weather crop is to be manured it should be with a mixture of both oilcake and ammonium sulphate as a top dressing. A dressing with the superphosphate manure at the sowing time also required to be tried out.

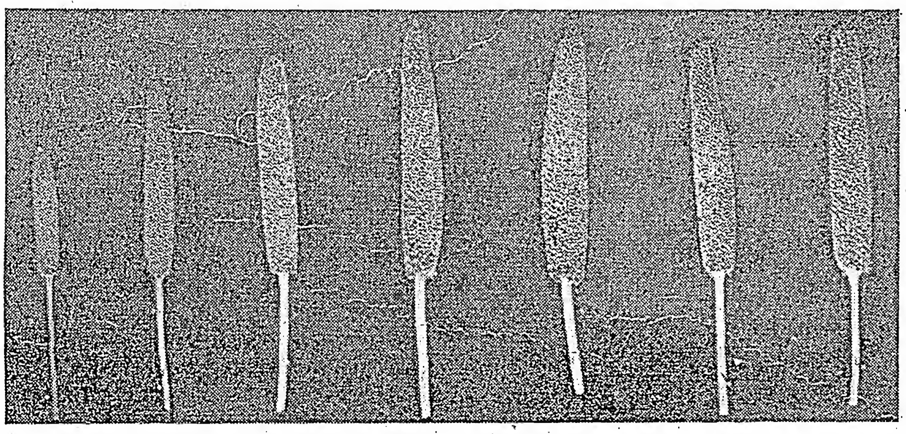
(*c*) More seeds per dibble should be sown to enable more plants to be kept per hill or a dibble. This would help to obtain more fruitful heads per hill. If possible, tillers should be removed to give chance for the main shot to develop fully.

(*d*) In irrigation intervals also some modifications seem necessary in fixing intervals suitable for the various stages of the plant growth.

Mr. Girdharbhai Patel is contemplating to effect suitable modifications in view of this year's experience so as to obtain still better results by judiciously utilizing the resources to the best of his ability and knowledge. It is suggested that if the progressive farmers who try out such methods pull their experience together better results could be obtained in a short time without frittering away the resources of individuals in gaining the same experience.

Better still, if such trials are carried out on Government farms and institutions systematically on scientific lines. The experience of the farmers will help to lay out experiments on knowledge already gained.

Scientists like plant breeders can help by evolving the most suitable variety, and agronomist, in working out the suitable technique of raising the Bajri crop in the Kaira district in hot weather, specially by intensive cultivation methods.

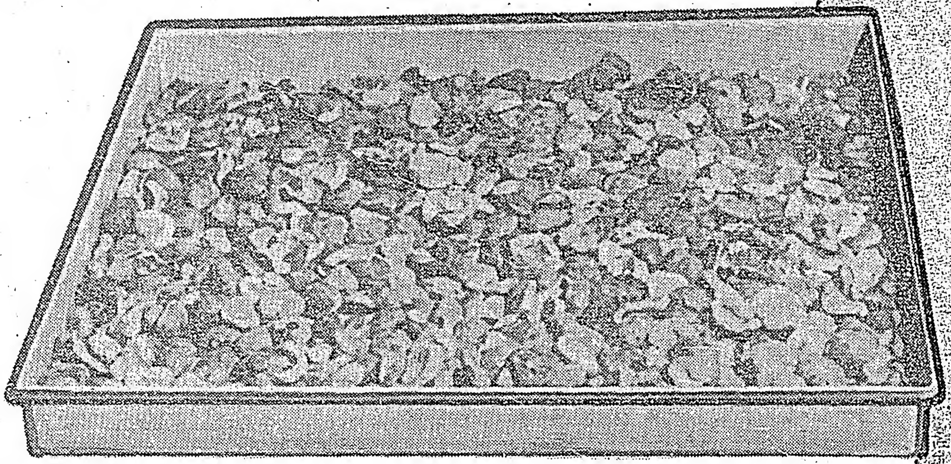


Bajri earheads

Shri Munshiji has given prominent place to intensive cultivation in his land transformation programme and, it is upto the scientist and Government farms and institutions to further this programme by placing at the disposal of farmers means, materials and practices that can give the optimum results under their conditions. Local press can help by advertising these results and pulling the experience of progressive farmers for the scientist, to improve upon, and develop these into workable practices. Only by such a cooperation the existing resources of the country can be put to the best advantage.

"SINGHARA"

(TRAPA BISPINOSA)



as a partial substitute for cereal

By

M. SWAMINATHAN and **P. B. MATHUR,**

Central Food Technological Research Institute, Mysore

IN view of the high nutritive value of the *Trapa* flour and the shortage of cereals in the country, it is desirable that some encouragement is given to the cultivation of *Trapa* and the utilization of *Trapa* nuts in various forms. For example, *Trapa* is not grown at all in the Mysore State although the number and area of ponds is greater in Mysore State than in most other States in the Indian Union. Since it is an aquatic plant, it does not clash with the cultivation of other crops.

Trapa nuts are eaten raw when tender and are usually boiled when they have become mature. Dried nuts are made into flour, which can be used as a substitute for wheat flour in the preparation of "chapaties" or "puries". With other ingredients, it can be made into various types of sweetmeats like Barfi, Laddu, etc.

HOW TO GROW "TRAPA"

The usual method of cultivation of *Trapa* is as follows: After the harvest of the *Trapa* crop in December, a portion of the tank with about 3 ft. of standing water is puddled under feet and selected mature nuts are broadcast and pressed in the mud. Two to two and a half maunds of nuts are sown in an area of about one-third of an acre. The cuttings from this area suffice to plant an area of about one acre. About the middle of April the vines are plucked from the nursery, cuttings made and planted in an area of about one acre. Four to six cuttings are tied in a bunch and each bunch is used as a unit in transplantation. Flowering takes place in August and fruiting in October. Harvesting is done in November and December. Yield is approximately 1,600 to 2,000 lb. of dried nuts per acre.

STORAGE

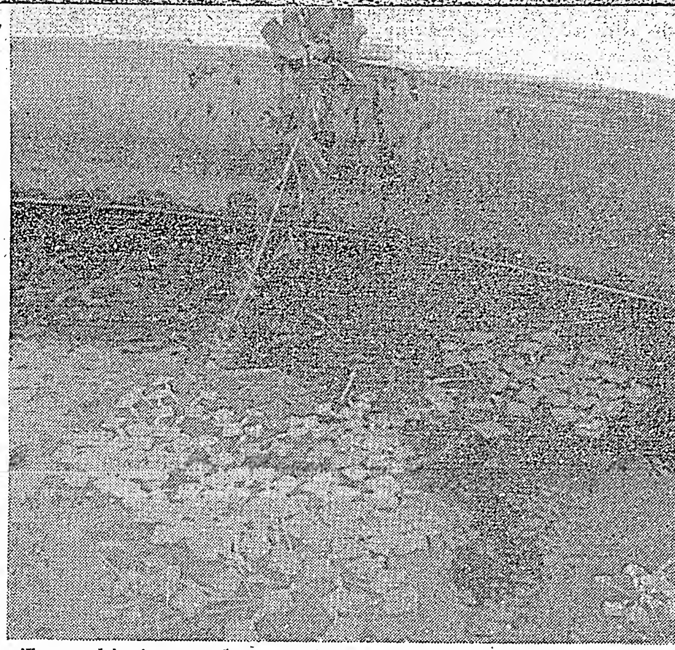
Seeds for planting can be preserved only for 10-15 days in earthen pots if kept soaked in water.

Nut kernels are prone to attack by insects and to the development of moulds unless special precautions are taken. Proper drying may overcome these difficulties and it may be possible to store them for a considerable time without any deterioration. Fumigation with methyl bromide may also prove effective.

NUTRITIVE VALUE OF "TRAPA" FLOUR

The overall nutritive value of *Trapa* flour was compared with that

One of the albino rats fed on a diet containing "Trapa" flour



Trapa bispinosa plants growing in a water tank in the grounds of the Central Food Technological Research Institute, Mysore. The pulled out plant shows the young, immature nuts

of rice and other cereals by the rat growth method. Groups of freshly-weaned albino rats (six in each group and distributed equally with regard to sex and litter mates) were fed with similar diets in which *Trapa* flour, rice, *cholam*, wheat and *ragi* were the main ingredients. The composition of the diets was as follows:

Trapa flour or cereals—78.5 %.
Tor dal (*Cajanus indicus*)—5.0 %.
Groundnut oil—5.0 %.
Non-leafy vegetables—8.2 %.
Leafy vegetables—2.1 %.
Milk powder—0.9 %.
Common salt—0.3 %.

The average weekly increases registered in the body weights of the rats in the various groups are given below:

Main ingredients in the diet	Average weekly growth rate
Trapa flour ..	5.9
Rice, raw milled	3.7
Cholam (*Sorghum vulgare*) ..	4.9
Wheat, whole ..	6.6
Ragi (*Eleusine coracana*) ..	7.9

The values for average weekly growth rates of rats show that *Trapa* flour is definitely superior to rice in its overall nutritive value.

CONCLUSION

Although *Trapa* is extensively grown in Kashmir and used more or less as a staple food by a large section of the people, its use in States like Uttar Pradesh, Madhya Bharat, Madhya Pradesh and Bombay is to a very limited extent. Further, in the Mysore State it is not grown at all. In view of its high nutritive value, the Central Food Technological Research Institute, Mysore, is engaged on an experiment to introduce *Trapa bispinosa* first in the city of Mysore and subsequently, with the help of the Mysore Agricultural Department, in the whole of the Mysore State.

Village level workers learning group discussion techniques in Burdwan, West Bengal

SOME SUGGESTIONS FOR A VILLAGE WORKER

outline of a typical extension programme

By DEVENDAR M. ANAND and MALCOLM ORCHARD

AGRICULTURAL extension service in India is concerned with the important problems of rural living and agricultural production.

It is nothing more than a programme of education and information and its philosophy is practical and simple; helping rural people to learn to help themselves; getting them to "learn by doing".

The outline of a typical extension programme in an Indian village can perhaps best be divided into two heads:

I. PRELIMINARY WORK

(*a*) *Establishing contacts:* The extension programme being an intensely practical one, almost everything will depend on the approach that is made to the villagers. The success or the failure of the programme will depend largely upon the thoroughness and tact with which this work is done. Personal interviews with the members of the families, visits to the sick and needy and full and friendly participation in the social and religious functions and ceremonies of the villagers, will help a village level worker to win the confidence and gain the friendship of the people among whom he is working. Rural workers should live right in the midst of the villages in which they seek to serve and make an attempt to understand the mental processes of ordinary villagers.

(*b*) *Promoting group discussions:* Once a village level worker has established friendly contacts with the villagers he will be in a position to promote group discussions of village problems. He will be able to help the village people learn to recognize problems which are most urgent and also learn the value of an organized approach to those village problems which cannot be solved by an individual farmer through his unaided efforts. Once he is able to demonstrate the valuable results which can be achieved through cooperative discussion and cooperative efforts, his task will be comparatively easy. He will then be able to induce the villagers to determine a priority list of the specific problems requiring solution in the village. As a practical step a village level worker may perhaps find it advisable to promote the organization of some form of village association in which a representative of almost every family in the village could be persuaded to become a member.

(*c*) *Leadership development:* Once such an association has been put on a working basis the main aim of a village level worker should be to induce the villagers to assume responsibility for group action. Assuming this responsibility is an elementary leadership activity; discharging this responsibility is the demonstration of real leadership.

How are the villagers to be trained to assume responsibility for group action? In order that leadership may develop, a village level worker must be satisfied to allow others to assume important responsibilities and he must feel happy at seeing others receive credit for work which he himself could have done. Experience has shown that the most

difficult job in developing leadership is breaking down the first resistance to responsibility. Once this first resistance is removed, local people with leadership abilities will spring up surprisingly fast.

How is resistance to leadership responsibilities broken? There are many answers to this question; but in general the village worker must seek problems for village solution which groups in the village are genuinely interested in solving.

The first efforts will be slow. But as soon as some of the members of the community discover that they can act as leaders, subsequent activities will prove to be much easier. The extension worker never issues orders, but offers suggestions and encouragement. When the leaders and villagers discover the satisfaction of achievement, they will be ready to tackle bigger problems. In short, every activity in which the village level worker participates must be dominated by the action of village leaders.

(*d*) *Village surveys:* After the village worker has succeeded in establishing contacts and inducing villagers to set up a village association he should try to pursuade the active members of the association to undertake the preparation of a village survey. These surveys should try to collect general information about the village, vital statistics, facts and figures relating to health and sanitation, the facilities for educating available in the village, facts and figures about the various crops and the livestock kept, the acreage under various crops and the production per acre, the acreage in wasteland, forest and grassland, etc., the number of acres in roads, buildings, borders, bunds, etc., particulars regarding the cottage industries in the area, the income and expenditure of each family, their poverty and indebtedness, the rates of interest prevailing in the village and any other matter of importance that is likely to help rural work. Such village surveys, if properly conducted, have two great advantages. Firstly, they enable rural workers to intelligently understand the difficulties and disadvantages under which the villagers are labouring, and secondly, village surveys enable rural workers to correctly gauge the amount of progress made in each village within a given period.

The first job is to establish contacts

In order that leadership may be developed

To organize youth clubs

(*e*) *Work with villagers:* Ultimately the aim of the village worker should be to organize youth clubs and young farmers' leagues in his area which would provide an opportunity to the village youth to engage in organized group activities aimed at improving rural life. These activities will also enable village youth to acquire useful information and become skilful in things which would be useful to them as future farmers and home makers. They will also help to foster pride in village life and develop confidence in our farmers of tomorrow.

II. MAKING IMPROVEMENTS

(*a*) *Applying findings of research:* It is a well known fact that the average income of an Indian farmer is extremely low. Although agriculture in our country dates far back the methods of cultivation practised in our villages today have not advanced much past the primitive stage and the implements used are invariably crude. The results of research have not reached the man in the village. One of the aims of the extension service will be to help the farm people to utilize new and better ways of farming which have been proven by research conducted in our scientific institutions. Through all the media of publicity, such as the printed page, films, slides, group meetings, demonstrations and individual advice, the extension service will try to achieve this object.

(*b*) *Demonstration:* The basis for getting farmers to adopt improved farm practices is found in the demonstration of these practices. The village level worker must realize early that every recommendation that is made for the solution of a village problem must be a recommendation that can be demonstrated. If the improved practices cannot be successfully demonstrated they should not be recommended.

(*c*) *First stage suggestion:* The following are some of the agricultural improvements which a village worker should try to get the villagers to adopt in the very beginning. The list is general and by no means exhaustive and is only meant for guidance. The underlying idea in the preparation of this list is that the village worker should in the first instance confine his attention to improved ways for doing things which are already being done in the village. The introduction of new enterprises and radically new ideas should be left to the second stage of the work.

(1) *Using improved seed:* Most farmers use seed that will not produce as much as new seed recently developed by breeding research on experimental farms. Better varieties are available through agricultural officers in your district. As villagers are most reluctant to plant new varieties in place of their old varieties, it becomes essential in the initial stages to demonstrate the superiority of the improved seed. These demonstrations should be conducted on farms of leading villagers, and should be conducted in such a manner that it will be easy for every villager to see the increased production the improved seed provides. It is recommended that the new seed be planted in plots alongside of the old seed and that both plots be treated in exactly the same manner so that the villagers can see that an honest demonstration has been conducted and will believe in the superiority of the improved seed if such superiority is demonstrated. Following the successful de-

West Bengal Point-4 Technician showing workers how to use an improved bullock scraper for moving dirt

monstration of an improved variety it should be easy to convince most of the other farmers that they should try this improved seed also.

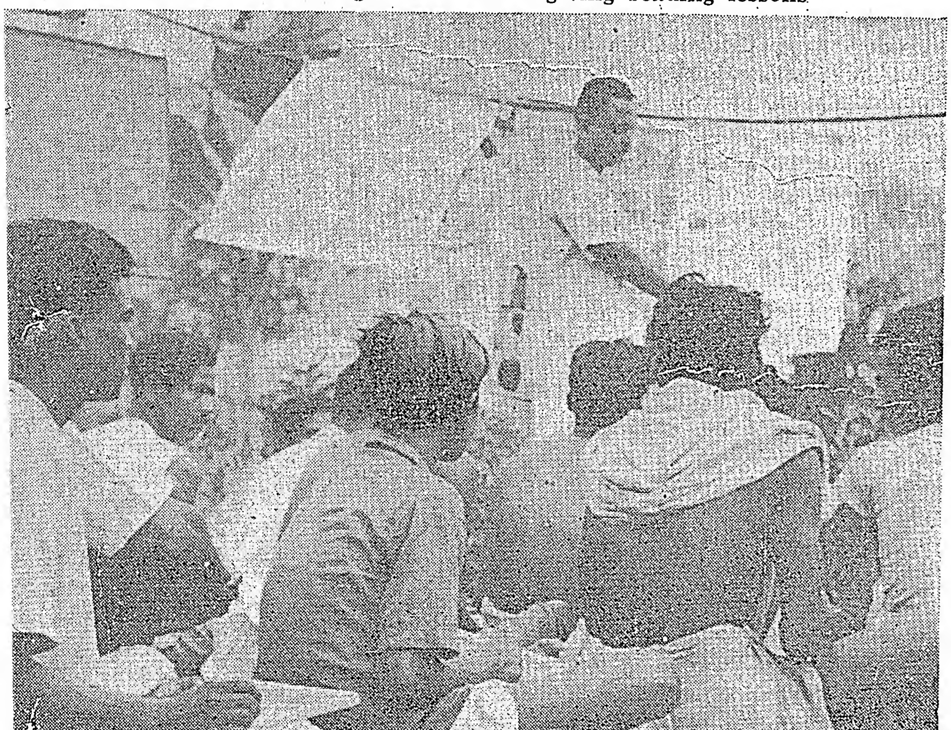
(2) *Increasing the use of manures and fertilizers:* This is another item of work which can be taken in hand immediately. All villagers are generally aware of the value of good manure. The rural worker should demonstrate to them the correct methods of preparing and preserving compost manure and show in demonstration plots the increased yields resulting from the proper use of this manure. In certain areas the village worker will be in a position to obtain supplies of artificial fertilizers. These artificial fertilizers should be recommended where their value has been demonstrated. In the same manner that improved seed are demonstrated, the use of artificial fertilizers should likewise be demonstrated. The village level worker should be cautioned, however, that artificial manures should not be tested on those lands which do not receive adequate water and are not well supplied with organic matter. Organic matter can be supplied through the turning in of manure or green manure crops.

It is recommended that green manure crops be demonstrated as early as possible in the extension programme. Careful studies should be made beforehand to determine the proper crop, time of planting, and time of returning this crop to the soil; how it should be fertilized and when following crops should be planted. If this information is not available in your district, small research plots should be established designed to determine answers to green manuring questions. Successful demonstration of the value of green manure crops should result in one of the greatest contributions that a village level worker can make to the increase of production.

Village workers learning use of movie projector

(3) *Improving cultural practices:* One of the simplest changes that a village level worker can induce villagers to adopt is a change in his method of planting and cultivating crops. This can be achieved through inexpensive demonstrations on small areas. Line planting, economical plowing and cultivating are examples.

Village level worker giving reading lessons



(4) *Improving livestock:* Improvement of livestock should be an important part of every village worker's programme. It is a well known fact that useless male animals are easily discarded and that it is more economical to maintain one good cow than two poor ones. The use of improved sires can be encouraged, or artificial insemination institutions can be patronized. Excessive livestock will retard the village level worker's programme of improvement and he should determine every proper means for establishing a more economical livestock management programme.

(5) *Controlling pests and diseases of crops and livestock:* This is another item of work which the village worker can demonstrate immediately and should take in hand early in the programme. There is

(*Continued on page 29*)

THE PROBLEM OF DISSEMINATING AGRICULTURAL INFORMATION

By

HARKIRAT SINGH

NOTWITHSTANDING the great amount of agricultural research that has been successfully conducted by the Indian scientists, the farmer in the field still sticks to the old and traditional methods of farming. The results of such research have generally been available to the technical persons and those already initiated in scientific agriculture. But, paradoxically enough, in all programmes of agricultural information hitherto organised, the primary producer has invariably been neglected. Consequently, a wide gulf exists between the laboratories and the man behind the plough. Even if this information has been put across to the farmer, this has been done in a manner unacceptable to him. As a result, it has failed to evoke interest and spur him to adopt better technique as farmers in the more advanced countries have done. This in the main is the cause of our low farm production level.

In the context of the prevailing food shortage and with the spectre of famine constantly haunting us the need for increased agricultural production is apparent. Indian agriculture must be so improved that it may meet the nutritive requirements of the country's population. To achieve this, the farmer must be completely won over; his confidence should be gained through sympathetic understanding and he should be urged to rise to the occasion. The advantages of using the improved seed, the beneficial effects of adding manures and many such aspects of agricultural practice should be brought home to him. It matters little how much information has been conveyed to him but it counts a lot how much of it he has been able to assimilate and apply. The ideas presented to him should stir his imagination. In this way, the efforts of the scientists could successfully be harnessed to solve the country's basic problem of increasing food production.

Many problems, some of them appearing to be insoluable at first sight, would have to be faced in organising an effective programme of agricultural information service. The first problem to deal with is the general illiteracy of the masses. There is no denying the fact, that illiteracy in India is widely prevalent. Any method, if it is to be successfully employed for supplying the newly discovered facts to the farmers in an effective manner, should be so evolved as to suit the illiterate recipients. Again, the economic condition of the Indian peasant must be constantly kept in mind while organising such a programme. Only such information as could be practically implemented without enhancing the cost of production should be given out. Apart from these considerations, the small size of the farmers' holdings, the various systems of land tenure prevalent, etc. present peculiar problems. The task of organising an all embracing agricultural information programme is, therefore, a stupendous one.

Of late it has been increasingly realised that nothing short of a well-knit organisation could possibly handle the difficult problem of disseminating of agricultural information to the farmers. The Agricultural Information Conference sponsored by the Indian Council of Agricultural Research should be considered as a forerunner of the broad-based information organisation that is contemplated to be set up. Delegates from the various State departments actively engaged in agricultural publicity have been invited to attend this Conference. Care has been taken to blend the unofficial interests with the official ones so as to ensure an enduring foundation. Many private firms dealing in agricultural machinery, manures, fertilisers, etc. usually employ novel methods to popularise and market their products. Experience thus accumulated is intended to be fully exploited and made use of in evolving effective methods of agricultural publicity. An exhibition, designed to spotlight the media already used and the potential means of disseminating agricultural information, will also be held on this occasion. The value of the various methods would be carefully assessed by the many participating experts, and ways and means of securing better results would be devised.

Public opinion in the rural areas will also be mobilised for this purpose for it is the villages where such an organisation should ultimately have its ramifications. A network of organisations right from the Centre down to the villages dealing with agricultural publicity will be set up. A small central organisation will be formed at the top to supervise and coordinate the activities of its constituent parts. This central body would be a reservior of all information relating to agricultural progress and would act as a clearing house in respect of such information. This central agency would collect, sift and arrange information in a presentable manner and pass it on to the organisations at the State, District and Village levels for its ultimate transmission to the farmer through teachers, extension and social workers and others engaged in village uplift work. It would thus endeavour to canalise information to the farmer. Adequate facilities for translating this information into various regional languages will also be made available. This would ensure uniformity and accuracy, and the information emanating from this source would carry the hall mark of authority and genuineness. Needless to add that the farmer would accept it without much doubt and mental reservation.

As for the means and methods to be adopted by this organisation, it would mostly confine itself to conveying the required information to the farmers

through the medium of written pamphlets in different languages, newsletters, posters, talks, dramas, charts, films and other similar ways of disseminating information among the primary producers. Practical demonstration has been recognised as an effective means of bringing home to the farmer the new ideas in agriculture. The proposed organisation contemplates to leave this part of the work to the vast extension organisation that has been set up in the country with the inauguration of Community Project Areas. It would, however, fall on this informational organisation to keep the extension workers continually supplied with information on improved farm technique. This would, no doubt, serve a double purpose: Project Areas would serve as testing grounds for determining the efficacy of the means and methods employed by this organisation as also to reinforce and invigorate the extension movement.

Simplicity in presentation will be the foremost consideration for the sponsors of this organisation. Men with a flair for popular writing rather than men of letters would, therefore, be needed. Keeping in view the educational background of the recipient the information sought to be conveyed to the farmer will be couched in the simplest possible language. Due consideration will also be paid to the existing village conditions. Persons would also be needed to put out this information in humorous skits. Such information will also form the subject of interesting radio broadcasts specially directed to the listeners in the villages. Documentary films on selected subjects would be exhibited in the villages through mobile cinema vans. Newsletters carrying day-to-day information about the agricultural situation in the country and market news will be released for the benefit of the primary producer. Specially designed attractive posters and charts depicting ways and means of bringing about a change in the methods of farming and the advantages which would accrue to him by using better seed, better manures, etc. will be printed and pasted at places frequently visited by the villager so that he is impressed by what is sought to be conveyed to him. A change in his general outlook would then be expected to come about.

How far the proposed organisation is going to be a success is difficult to foresee. This will nevertheless depend on the amount of cooperation that will be extended to it by the various interests involved, the efficacy of the means and methods employed, the financial resources at the disposal of the organisation, the willigness of the farmer to accept this body as his own and many other factors that crop up when this huge workshop actually starts functioning. For the present, however, all eyes are hopefully turned towards Lucknow, the venue of the Conference to be held in the third week of November this year.

NEW POTATOES FOR OLD

(*Continued from page 6*)

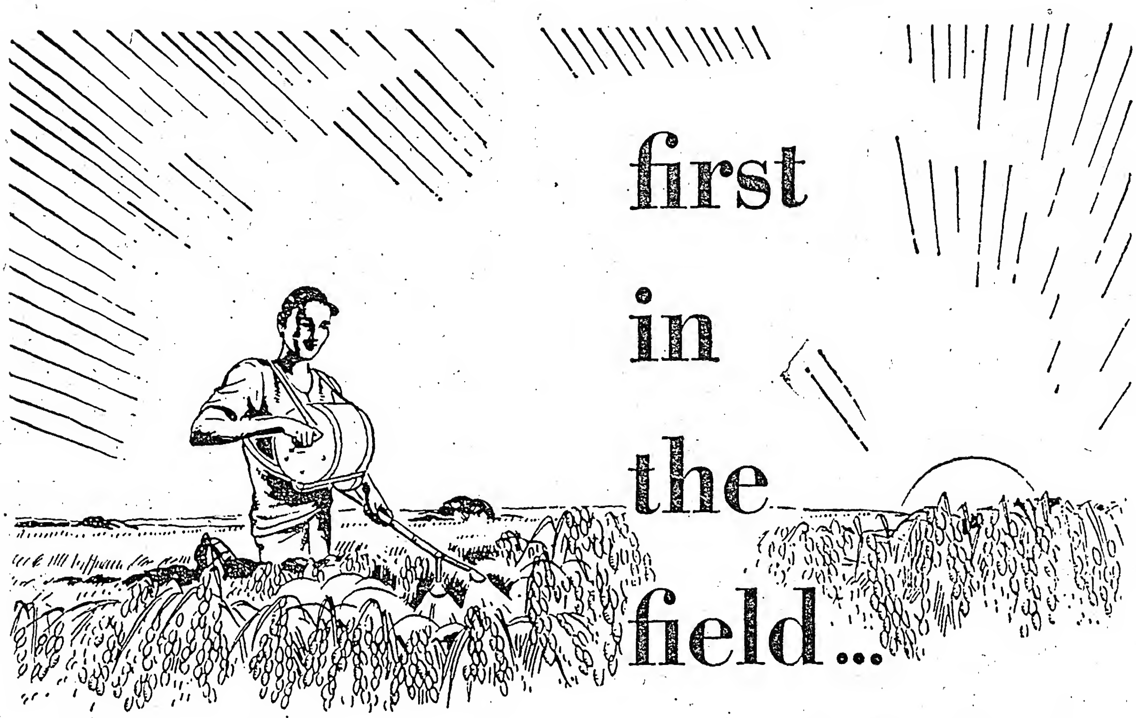
as berries. These precious, tiny seeds which form the basic foundation material from which new varieties emerge are sent down to Patna. The seeds of each cross are separately sown in earthen pans in a mixture of sterilized soil and sand. The seeds germinate within about 10 days and when the delicate seedlings attain a height of 4"-6" they are first transplanted in small seed-beds where the plants establish and 'harden'. A special field is prepared and the young seedlings are retransplanted in it after a fortnight. Each seedling is carefully observed for its growth, vigour, disease incidence and at the time of harvest specially assessed for yield and tuber characters. Almost every seedling differs from the other in some observable characteristics. This is because a large number of characteristics in which the mated varieties differ are as a result of crossing and invariably every seedling inherits almost a different and distinct combination of characteristics. The seedling progenies of crosses thus provide varied material for the expert to select plants with desired attributes.

SELECTION

The breeder has to watch the seedlings and their progenies at least for 5-6 years before final selections could be made available for large-scale multiplication. In the first year, thousands of seedlings raised from the seeds are under observation as mentioned above. In the second year, tubers from each of the selected seedlings (2000 or so) are planted in 'observation rows' for further study. After a rigorous selection about 20 per cent of the rows qualify for a further test in the third year. In the third year's test the replicated trials act as a decisive sieve to eliminate the less promising types. The efforts thus begin to take a shape. Starting from thousands of seedlings it is possible to select only about 100 commercially desirable types at the end of the third year. In the fourth year, these selections are sent to the States for an adaptive trial and at this stage further elimination of hybrids which do not approach the best of the commercial varieties under a specific set of climatic conditions is possible. Finally, about a dozen promising hybrids are selected and in the fifth year, large scale trials are conducted. The cycle of producing crosses, growing of seedlings, study of observation rows, replicated and adaptive trials continues. Each potato growing tract is thus annually fed with new and better types of hybrids for trials. As a result of such a series of trials, it becomes possible to fit in suitable potato varieties for each climatic zone.

CONCLUSION

The results so far obtained have been encouraging. Nearly half a dozen hybrids are now available for large scale multiplication and distribution. The Government has recently sanctioned a National Scheme of Potato Development for making available better and healthier types of potatoes to the grower. A stage has thus been set to translate research iuto practice. At present, hybrids O. N. 45, 208, 209 and 295 have been found to be promising in the plains of the Punjab, Delhi and U. P. Hybrids O. N. 1151, 2186, 2236 and 2287 have given excellent results in Bihar, Bengal and Orissa. These are being multiplied. As the work progresses it will will be possible to have even a superior batch of hybbrids for these tracts. And thus the work on regionalization of potato varieties is steadily marching on towards its final goal.



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ICI

IX-F 37

SOME SUGGESTIONS FOR A VILLAGE WORKER

(*Continued from page 25*)

quite a bit of wrong information prevailing regarding the best methods for controlling various diseases and pests, so the worker should be sure that his information is reliable. In this field he can easily make mistakes that would retard his programme for many months. If proven methods for controlling a particular pest or disease are not available, the worker should consult his superior officer, and if he is unable to provide the latest information, state authorities should be consulted. From time to time printed material on the control of important pests and diseases will be available through the Indian Council of Agricultural Research. This material may be obtained by writing to the Council. When a particular pest or disease attacks crops or animals and the village level worker has adequate information and facilities for controlling these attacks he should make every effort to see that neighbouring farmers and villagers witness his control methods. This type of demonstration, if successful, will prove the way of quicker reception of future advice and recommendations.

(6) *Improving storage methods* : The loss caused by defective storage of various crops in the villages is estimated to run into crores of rupees per annum. This is an important problem and is one which villagers can recognize easily. The village level worker can, therefore, devote attention to the solution of this problem early in his programme and feel that he will receive the sympathetic attention of the farmers. There is also a great deal of false information on the best ways to conserve grain and other stored products, so the village worker must be armed with information based on research or obtained from reliable authorities and firms. In this problem, as in others, the aim should be to avoid recommending fantastic and expensive methods even though they may be effective, and to recommend successful methods which are adapted to local conditions and to the ability of the people to adopt.

(7) *Improving agricultural implements :* Any new agricultural implements should be successfully demonstrated by a local farmer and enthusiastically approved by local demonstrators before any such implements are recommended for wide use. The factors involved in determining the value of a new implement or tool are numerous and are often too involved for the general worker to handle. It is, therefore, suggested that villagers be encouraged to experiment with new devices, but that the village level worker refrain from making positive recommendations without the support of successful farmers in his village. After the village worker has become well-established in his community and is accepted as a reliable adviser, it may be that he can make recommendations for the cooperative ultilization of equipment that may not be adapted to the village in current conditions of individual ownership of equipment.

(8) *Improving marketing :* Much of the hardship caused in our villages is due to the lack of adequate marketing information and facilities. In the survey mentioned previously, a complete record of marketing procedures an results should be available. The village worker should study these marketing procedure and ask leaders in his village to assist him in determining ways and means to improve the returns the villager receives for his product. After a careful study is made, however, and after villagers thoroughly understand the problem and are in complete agreement, steps should be taken which should increase the villagers' return.

(9) *Improving sanitary conditions :* This is another problem which can be approached slowly but effectively. Each improvement

(*Continued on page 32*)

A CORRECTION

"September 1952 issue of Indian Farming page 3, for the heading RESEARCH IN COTTON *read* RESEARCH IN COTTON IN THE PUNJAB."

HINTS TO THE FARMER

(*Continued from page 9*)

should not be cut after February. As the plants flower, irrigation should only be given sparingly as liberal irrigation at this time will influence the growing of new shoots, thus hindering the seed formation and reducing the yield of seed. By about April the crop should be harvested. Two to three maunds per acre yield of seed should be considered as a good yield.

SENJI

If berseem is preferred because of its high results and lucerne for its perennial nature, *senji*, has its own useful points to make it one of the important fodder crops where supply of irrigation water is restricted. Senji has been under cultivation since very ancient times especially in rotation with sugarcane. Senji is a short duration crop and leaves the soil in rich condition.

Soil and climate: It is a cold weather crop requiring soils of medium to high fertility. It is especially suitable for the northern India tract where climatic conditions are favourable for its growth.

Preparatory tillage: The land should be prepared as for berseem.

Manuring: Since *senji* follows manured maize or cotton in rotation manuring may not be necessary. But manuring with 1½-2 maunds of ammonium phosphate will result in increased yields.

Seed rate and sowing: The crop is usually sown by the end of September to the middle of November. Twenty to twenty-five seers of seed with the husk on or twelve to sixteen seers of seed without the husk are usually required to sow an acre. As the seed coat is hard it is advisable to soften it by lightly beating the seed or rubbing the seed with a soft brick. The seed is broadcast on a moist seed bed and is mixed with soil by a harrow and then covered by running a plank. It can also be sown in standing water as in berseem. Six to eight hours soaking in water assures successful germination.

After-care: Weeding in young stage would greatly benefit the crop. The first irrigation is usually given after seven to ten days of sowing. The subsequent irrigations may be given at intervals of fifteen to twenty days or as required. Generally two to three irrigations would be quite enough for the crop.

Fodder: The crop shows quick growth in spring. Senji gives one cutting and it should be cut at a stage when the plants are in full flowering and seed formation has already started. The fodder is available from January to the beginning of March. Under favourable conditions the yield goes to over 200 maunds per acre.

Feeding: It is advisable to chaff the fodder and mix with *bhusa* or other dry roughages for feeding the cattle. This is necessary because otherwise *senji* is apt to upset the digestive system of the cattle.

SHAFTAL

While berseem is preferred because of its high yield, lucerne of its perennial habit, *senji* because of its suitability under restricted irrigation facilities, *shaftal* is preferred for its suitability for pasture purposes as it withstands grazing. Originally from Persia and hence known as Persian clover, it had been an important fodder crop of the Punjab. With the introduction of high yielding berseem, the area under *shaftal* has considerably reduced.

The soil and climatic conditions for *shaftal* are similar to those for berseem. The method of cultivation is also similar except that the seed rate is only five to six seers per acre because of the smallness of the seed.

As observed in the Punjab, *shaftal* does not require any inoculation and can be successfully raised on new lands. This quality in *shaftal* makes it an important pioneer crop for the introduction of berseem.

It gives three to four cuttings from December to May yielding about 300 to 400 maunds of green fodder per acre. For seed production it should be left after the second cutting. About three maunds of seed per acre can be obtained.

METHRA OR METHA

Methra is another Indian legume which has long been under cultivation. It is preferred because of the lesser irrigational requirements as compared to *senji*.

Climate: It can be grown under a variety of soil and climatic conditions, almost in any part of the country. Rich loamy soils particularly suit the crop.

The tillage and other operations are the same as given for other legumes described above. Twelve to fifteen seers of seed is required for an acre. The seed should be uniformly broadcast on a well prepared moist seed bed and covered with soil by harrowing and running a *sohaga*. Weeding in the early stages helps the crop. Three to four irrigations are enough to get a good yield.

Fodder and feeding: The crop is usually ready for harvest in three to four months after sowing. A good crop yields 200-250 maunds of fodder per acre. The fodder is fairly nutritious but is said to affect the milk yield adversely if fed in large quantities. As already stated such legumes should form only 30% of the total fodder requirement.

OATS

Oats are not extensively grown in India except on the military grass farms. It is considered to be very palatable and nutritious and is especially popular for feeding horses. Oats are also grown for grain which is fed as a concentrate to the milch cattle.

Soil and climate: It is a cold weather crop growing on all types of soils, fertile loam soils with better water retentive power however, being preferred.

Seed bed preparation: Like other crops, the soil preparation needs to be thorough for the cultivation of oats.

Seed rate and sowing: The crop is usually sown from the middle of October to the middle of November. Twenty-five to thirty seers of seed is required to sow an acre. The seed is usually broadcast on a moist seed bed, is mixed by harrowing and covered by running *sohaga*. It takes about five to ten days for the seed to germinate.

After-care: No particular care is necessary except that the irrigations should be given as required. Three to four irrigations are usually required for fodder purposes.

Fodder: The crop for fodder purposes is usually ready for cutting in February. The best stage for cutting oats as green fodder would be just after flowering. Under favourable conditions of manuring and irrigation it is possible to take two cuttings. The first cutting may be taken in January when the crop is above two feet high and before the appearance of the flowers. The second cutting is then taken in March when the grain is in the milk stage of development, and the fodder is at its best.

The yield of green fodder varies from 200-250 maunds per acre. Oats green fodder has a special position as a cold weather fodder for horses. The fodder can be easily converted into excellent hay.

JOWAR

Jowar is one of the most important food and fodder crops especially in the low rainfall tracts. It is one of those fodder crops which produce a large quantity of green fodder in minimum time under relatively unfavourable conditions. The winter varieties of *jowar* are mostly grown in Western India under the name Shalu.

It can be grown both under rainfed and irrigated conditions.

Soil and climate: Jowar flourishes on all types of soils but best yields are obtained on well drained medium to heavy loam soil. The *rabi* varieties grown either for grain or fodder require milder winters.

Preparatory tillage and sowing: For sowing *rabi jowars* land requires to be ploughed early in monsoon and regularly harrowed to destroy the weeds and to conserve moisture. Where irrigation is available land be prepared as for other *rabi* crops.

Seed rate and sowing: The Shalu *jowar* is usually sown from mid-September to the end of October. The seed, at the rate of 20-25 seers per acre is usually drilled and covered by light harrowing. The seed is also sown broadcast.

After-care: Hoeing between rows will benefit the crop. In case the crop is sown by broadcasting, no weeding will be necessary. The crop may be irrigated as required.

Fodder and feeding: The fodder can be cut $2\frac{1}{2}$-3 months after sowing. Care should be taken not to cut and use the fodder until the flowering stage. If cut before this stage it is likely to cause poisoning of the stock. Even if the fodder is cut before flowering and dried the poisonous quality is still retained and hence cutting before flowering should be scrupulously avoided.

The yield varies between 200-250 maunds of green fodder. It is very greedily eaten by the livestock.

RAPE OR SARSON

While most of the crops described above require irrigation at some stage or the other, *sarson* is a crop which can be grown under unirrigated conditions or where irrigation water is limited. Further, it is a very quick growing crop and is avilable as early as mid-December. Japan Rape and Raya have shown better results in the Punjab.

Soil and climate: Sarson is not exacting in soil requirements, but prefers a good loamy soil. It can also successfully grow on sandy loam soils in rainfed areas.

Preparatory tillage: Since the seed is very fine it is necessary to have a thorough and firm seed bed.

Manuring: Manuring with 5 to 8 cartloads per acre of farmyard manure will give best results.

Seed rate and sowing: Sarson can be sown in mid-September in *barani* areas to the end of October in the irrigated tracts. The seed rate is at 3 seers per acre. The seed being small should be mixed with equal quantity of soil before broadcasting. This will secure a uniform stand; after mixing with harrow a light planking should be given.

Fodder and feeding: The fodder is ready by about the middle of December and can be fed till the end of January when it starts flowering. Yields from 250 to

350 maunds of green fodder per acre can easily be obtained under favourable conditions.

TURNIPS OR SHALGHAM

Turnip is a dual purpose crop which can be used for human as well as for animal consumption. It is a high yielder root crop rich in vitamins and phosphate but is especially suitable for growing under irrigation only.

Soil: Turnips are exacting in soil requirements; fertile loamy soils are preferred. Heavy manuring would result in heavy yields.

Seed rate and sowing: Turnips are generally sown from September to the middle of October at the rate of $2\frac{1}{2}$-3 seers per acre. The seed is broadcast on flat beds or preferably should be sown on ridges $1\frac{1}{2}$-2 feet apart.

After-care: The first irrigation should be given about a month after sowing. Subsequent irrigation can be given after an interval of a fortnight.

Fodder: The crop is ready for feeding in $2\frac{1}{2}$-3 months after sowing. The roots can be lifted and fed from December to February. A good crop yields 350 to 400 maunds per acre.

SOME SUGGESTIONS FOR A VILLAGE WORKER

(*Continued from page 29*)

can be made with self effort. Once the villagers are organized and sanitary measures are generally approved by them, and once the village leaders are convinced that action is worthwhile, good results may be seen very quickly and economically.

(10) *Utilization and conservation of water:* This is clearly one of the most important problems confronting the farmer. Due to the fact that procedures in utilization of irrigation water have been evolved through centuries of practice in India any changes which the village level worker might like to introduce will be met with considerable resistance. Also conservation has not received much emphasis in the past and any plans for developing an interest in this aspect of the problem will likely be received slowly. Nevertheless, the problem is important and the worker should begin early in his career planning ways and means of eventually achieving some correction.

(11) *Other problems:* The above listed problems are those which a village level worker may include in his programme soon after he is assigned to his community. There are other important problems that will present themselves as the work progresses. Those listed here are in general terms. Each one is vast enough to become a programme almost in itself. None of these problems is likely to be completely solved in the near future. All, however, must be attacked and some small progress must be demonstrated. As this small progress is demonstrated in each of the above problems, the village level worker will realize that he has a programme and that he can afford to be proud of its results.

FARMER OF THE MONTH

(*Continued from page 5*)

provide for more adequate irrigation facilities as required by her.

PASSING THOUGHTS

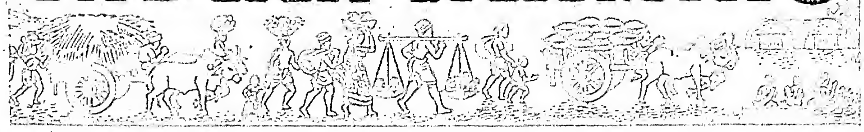
"Should women be farmers?" I asked her. In reply she led me to her Studebaker car and said "this has come out of my land. What is there to prevent women being successful farmers. There are many in India even today."

Muqurrab Begum is proud of her village and of the fact that she can play a notable part in the development activities of the State. Her being alone does not worry her. When she was asked what arrangements she is going to make for her farm when she feels tired of all these activities her reply was typical. "None," she said. Her own nephew, who is now Chief of the Ford Foundation Training Centre, in the employ of the State Agricultural Department, has been of no assistance to her for obvious reasons. She does not believe in leaving anything for anybody; in fact, she considers it detrimental to the interests of the coming generation if it were to be pampered by the legacies left by those who sweated and toiled to accumulate it. Her principle is to enjoy the life while she can and then forget all about it and not to worry about who will get what when she is no longer active—a very sensible attitude indeed.

Bhopal has the distinction of having a number of lady farmers carrying on farming operations all on their own. No doubt all of the country's lesser farmers also include ladies looking after this hard work, but credit must be given to this lonely lady of Bhopal for holding her own in a male dominated world.

—PUSHKAR U. OZA

INDIAN FARMING



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IMPORTANT AND URGENT

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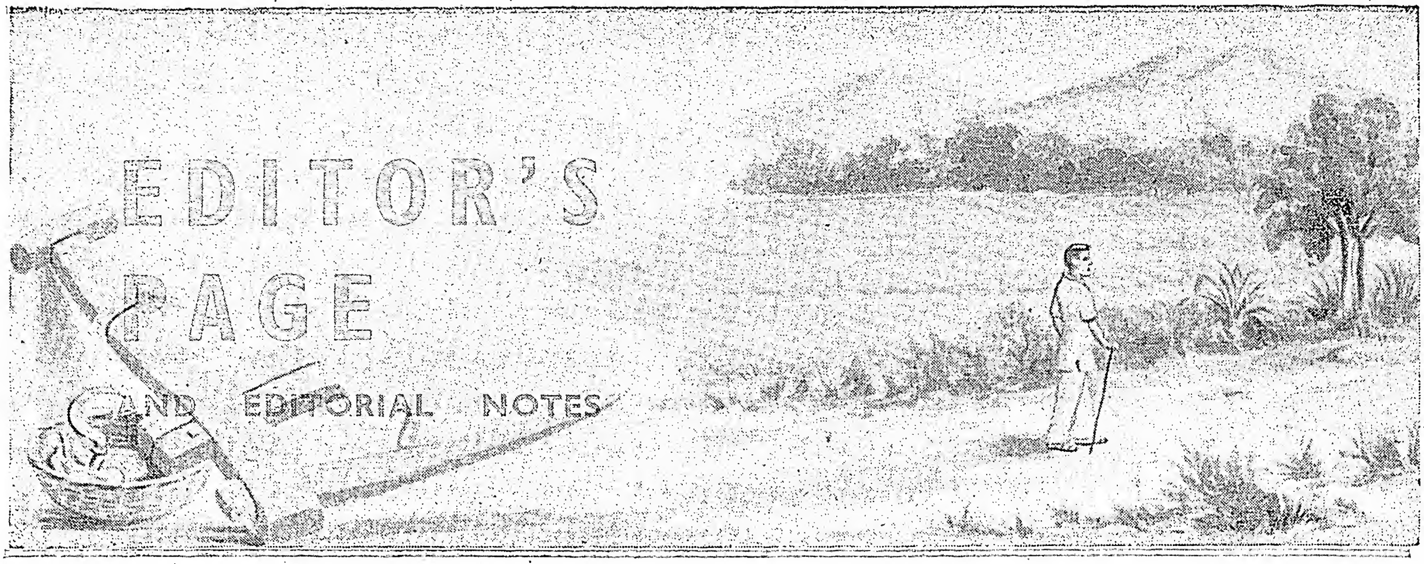


There has long existed a regrettable gap between the research workers in laboratories and the farmers in the field. In order to bring about improvement in agricultural methods and practices, it is necessary that this gap should be bridged so that a constant flow of information from the laboratory to the field is ensured. Not only that. It is also of importance that problems of the farmer should be sent up to the experts for solution. In order to discuss this and allied problems, the Indian Council of Agricultural Research called a conference on the dissemination of agricultural information. This conference met at Lucknow and was in session from the 17th to the 19th November 1952 and was attended by representatives of the Central and State governments, farmers, trades and other private organizations connected with agriculture. A few members of the Parliament also attended.

The fact that representatives of various interests met at a common platform and evinced keen interest in the problem of dissemination of agricultural information points to the awareness of the problem throughout the country.

The Conference discussed the problem from all possible points of view. One of its primary recommendations was that a Central Agricultural Information Organization should be set up with the object that the scientific information is brought within the reach of the farmers throughout the country and also ascertaining his problems for solution. This organization will function through an agricultural information machinery in which various interests will be represented. The main task of this machinery will be planning and helping the agricultural information programme on an all-India basis. In order to act effectively, it is proposed to have a network of agricultural information committees at the State, district, Tehsil and village levels. With regard to the village agricultural committees, initial efforts must appropriately be concentrated in the project areas.

In order that the farmer benefits from the organization which is to be set up, it is necessary that information should be available to him in a manner in which it is comprehensible to him. The low level of literacy in this country has to be recognized in this connection. It is apparent therefore that printed words may not be an adequate medium for conveying agricultural information to the farmer. Other conceivable media of extension work have to be taken recourse to in order to achieve the object. The extension work should be fitted in as far as possible to the actual life of the farmer and the social set up in rural areas. Apart from publications, not only such well known media of publicity as films, radios, etc. should be used, but other unconventional means and methods such as local social functions, rural fairs should also be utilized for this purpose.

It is necessary that the information to be passed on to the farmer should not be dubious in any way. The importance of the organization will be, to a great extent, judged on the authenticity of the information it supplies. For this organization to grow up as intended, special responsibility therefore rests on the specialist advisers it chooses and that is to ensure dependability of the recommendations they make to the farmers.

The great significance of the Conference at Lucknow rests on the fact that it sought to provide a basis for the solution of various problems connected with the collection and dissemination of agricultural information. This stupendous nature of the task which this Conference sought to handle was apparent and no attempt was made to minimize it. It was realized that in order to handle the work on such a gigantic scale a great deal of initiative, planning and hard work was necessary. It was thought worthwhile to undertake such a task so that the level of agricultural production in this country might be raised. Discussions in various committees naturally centred round the basic problems and it was

rightly decided to bring into existence a coordinated well-knit agency entrusted with the task of collecting and disseminating scientific information relating to agriculture.

It should be noted here that this was the first time that such a conference was held in this country and the interest and enthusiasm evoked among the participants was indicative of its importance and incidentally of success as well.

The significant part played by the trades and non-official organizations interested in agriculture needs to be stressed. Their whole-hearted cooperation was indeed a welcome feature and a happy augury for the future of the organization.

A very instructive feature was the exhibition of media and methods that was arranged along with the Conference. In this exhibition were shown the various media and methods that could be employed in disseminating agricultural information. The items were such as could be easily adopted in this country to suit special problems in disseminating agricultural information. Publications, charts, models, advertising media of various types, story-telling devices like flannelgraph were all arranged in an instructive manner. In this exhibition also the trades and non-official organizations had sent their exhibits generously. From the number of visitors who saw the exhibition and keen interest that the exhibits evoked, it was felt that such an exhibition was an urgent necessity for the realization of the potentialities of the various media exhibited. The usefulness of such an exhibition in the dissemination of agricultural information could hardly be over-emphasized.

* * * *

A report has just been received from Nagpur showing the beneficial effects of systematic spraying with 50% Benzene Hexachloride for the control of malaria. The work was done in the Sindewahi Project area.

In 1951 only two villages in the 100 village block were sprayed. In August of that year 78 malaria patients were treated, or 15% of the total patients in the block. In September also 15% of the patients were malarial patients, and in October there were 120 malarial patients representing 22% of the total patients in the village. In 1952 three sprayings with 50% B.H.C. were applied at 6 weeks' interval in this block. In August, 1952 only 5% of the patients were malarial patients: in September 7%, in October 6%. The number of malarial patients for October, 1952 was 43, compared to 120 in October, 1951.

Improving health is justification in itself; but one excellent way of increasing production has been demonstrated by the malaria control work done in Sindewahi.

OUR COVER

Damodar Valley Project (West Bengal and Bihar) is one of the most important schemes which are being executed by the Central Waterpower, Irrigation and Navigation Commission—India's national agency, for the multi-purpose utilization of water resources

Damodar Valley: Survey party at work near the Konar Damsite

MEN OF THE MONTH

SIKH FARMERS RAISE *Record Wheat Crop*

By

A. R. VYAS

THREE miles from Khanna in eastern Punjab, on a metalled road lies a village with the musical name of Kalal Majra. Here two Sikh farmers have carved out of a wilderness of five years ago, a farm which has raised over 71 maunds of wheat per acre, against the Indian average of about 7 maunds.

These two enterprising farmers are Sardar Ajit Singh of village Kuthar of Jullundur district, and Sardar Gurudev Singh of village Shanker of the same district. Both come of sturdy farmer stock of Punjab which had made that province the "granary of India" before partition and made it self-sufficient within a year after. I was introduced to these "heroes of the land" during my visit to Khanna on *Vijaya Dashmi* day, by my genial host Sardar Hakim Singh. This agricultural officer has done much to increase production from the land, which lies within his jurisdiction. I was told that in the Samrala Tehsil, no American cotton was grown in 1948; now variety 320 F is grown on 3,000 acres, next year the area is expected to increase to 6,000-7,000 acres, leaving only about 2,000 acres under the *desi* variety.

PARTNERSHIP ENTERPRISE

The 380-acre estate which is now known all over the area as the "National Model Farm" belongs to an absentee landlord, who let it run to weeds so that for years it could not meet even the government rent. In 1946 therefore when some persons came forward to take it on lease, he was glad to rent it for 7 years on an annual rental of Rs. 6,200. The first few years of the partnership venture were not noted for any outstanding success; expenses in clearing the land, fitting pumps for irrigation and paying labour were heavy, and there were too many partners which led to constant friction, misunderstandings and hold up of operations. Even so after a net loss of Rs. 15,200 in the first year, the production in 1947 brought in an income of Rs. 31,000 which just squared the accounts for that year. Since then profits began mounting every year, but the amount was small till 1950, when Sardar Ajit Singh and Gurudev Singh took over the sole management of the farm in partnership. The annual income in 1949 was Rs. 36,900; it rose to Rs. 39,900 in 1950. Last year it shot up to Rs. 59,850 and when

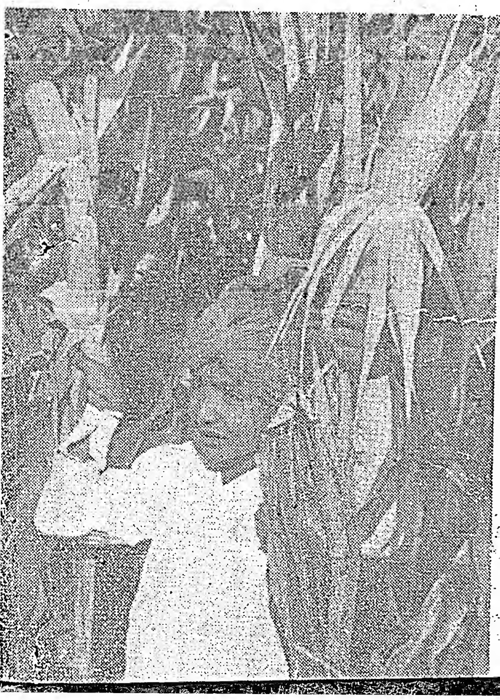
Field being ploughed for the next rabi—*Sardar Gurudev Singh at the plough*

accounts are drawn up at the end of the current year, the income will reach Rs. 80,000. This is from a land, which could not pay its rent only a few years ago; today it bids fair to have grown the largest quantity of wheat on an acre. Last year, the winner of the All-India first prize in wheat had produced 59 maunds 25 seers 11 chhataks per acre; the National Model Farm has grown 71 maunds 23 seers 10 chhataks!

PROFILE OF HEROES

I was interested in the men as much as in their achievements. The older Ajit Singh who is 40, finished his Intermediate course in Government College, Hoshiarpur, and unable to prosecute his studies further because of lack of funds, joined the army in 1931. He quit this job 8 years later, to join the All-India Charkha Sangh and was for some time in charge of the technical side of the Spinners' Association in the Punjab. When the freedon movement started in 1942, Ajit Singh was irresistibly drawn into it. Then followed imprisonment and internment. On his release he became the Manager of the Jullundur-Amritsar Bus Transport Co. But when partition came, he went back to his ancestral occupation—agriculture. He recounts with some amusement, the disappointment with which his father Sardar Dharam Singh greeted this decision of his son. Said the old man: "You have been in the army, wasted years on khadi and the Congress: What good will you do now in agriculture!" He has won outstanding success, but how easily a less unbending resolution, sustained by a less invincible self-confidence might have accepted failure.

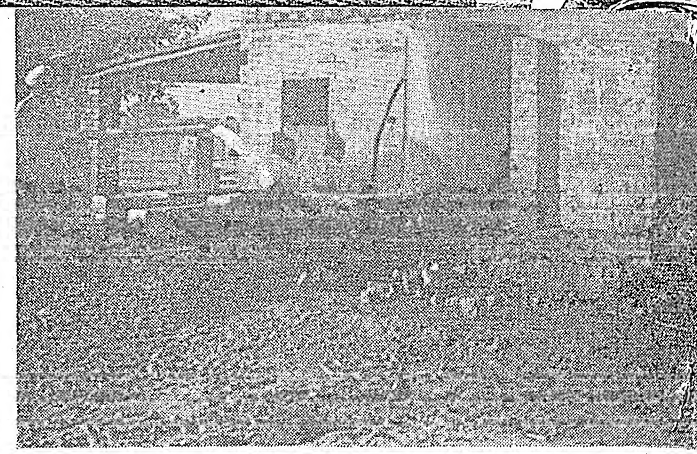
Gurudev Sigh is 12 years younger; he too did his Intermediate from the Khalsa College, Amritsar. Almost before he left his books, he had taken to the plough and in his case there were no interludes in the army, or in fighting political battles. In 1946, he joined the National Model Farm and plunged into the task of carving out a living from three hundred and odd acres of wilderness.



Seven-year Nirmal Singh, son of Gurudev Singh, on his father's maize fields. Each cob weighs 2 to 3 chhataks

They practise cattle breeding as well. One of the buffaloes of the farm which yields 18 seers of milk a day. A prize winner at the last Cattle Show.

The house where the farmers live with their family



16 H.P. pumps irrigate the fields night and day

A common love of the land, wide and varied experience of life and the unbounded energy and enthusiasm of youth make this partnership an ideal combination. As soon as I entered the Farm, I saw level, well-laid out fields being prepared for the ensuing *rabi*, and the standing crops of cotton, maize and sugarcane which were a delight to even a city-bred like me. How much more would they be to the farmers themselves, who see literally the fruits of their labour over the past three years.

During the current season, the farm has 60 acres under cotton, 20 under sugarcane and 7 under maize. I have it on the authority of Sardar Hakim Singh the local agricultural officer, that no better crops of cotton or maize can be seen anywhere for miles round about. Last year's cotton averaged 17 maunds an acre, this year it should be over 20 maunds. The same story of success is repeated in the case of maize. Last year the per acre yield was 81 maunds 10 seers, and individual cobs weighed 2 to 3 chhataks each; this year the growth is so luxuriant and the cobs are so full, that I should be surprised if a century is not reached. On this one and quarter-acre plot was grown the prize-winning wheat during the last *rabi*.

RECORD WHEAT CROP

The soil which is loamy was under vegetables during the previous two years. The pumpkins were harvested in June 1951 and the land was ploughed up by a tractor. This was followed by 15 ploughings with a *desi* plough and five or six plankings. To prepare a fine seed bed, there were three ploughings alternately with an equal number of plankings, all completed on the same day.

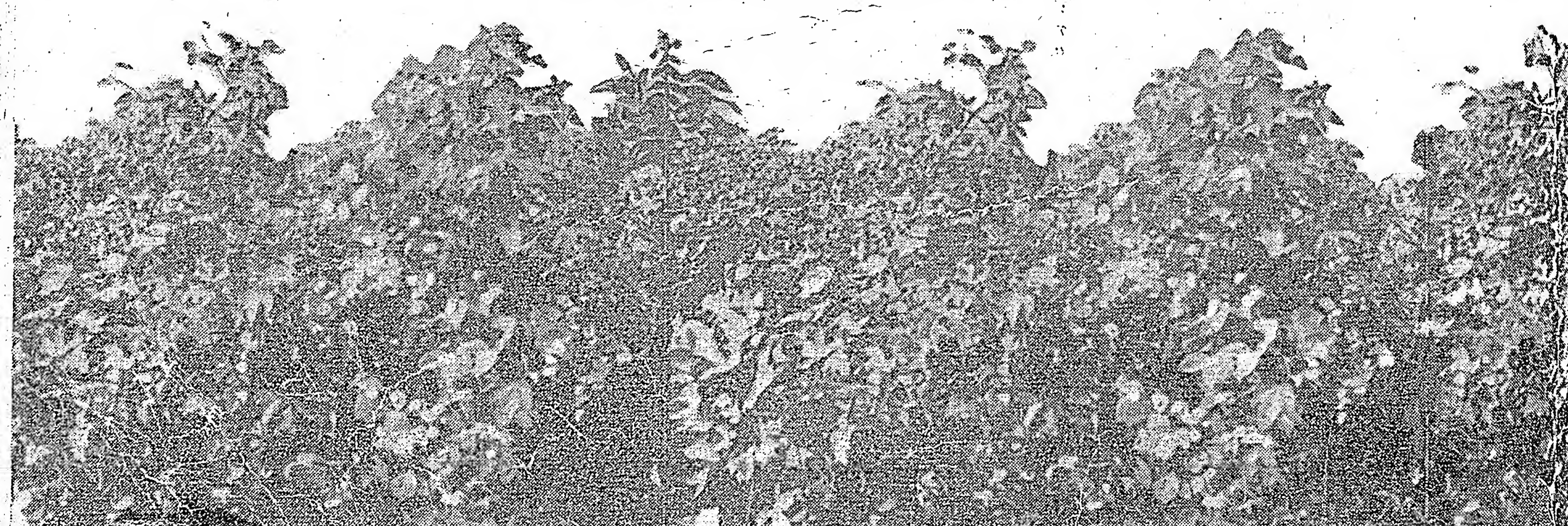
Wheat C 518 was sown on October 20, at the rate of 35 seers an acre. The sowing was done with the single row cotton drill and the distance between the furrows was between 6" and 7."

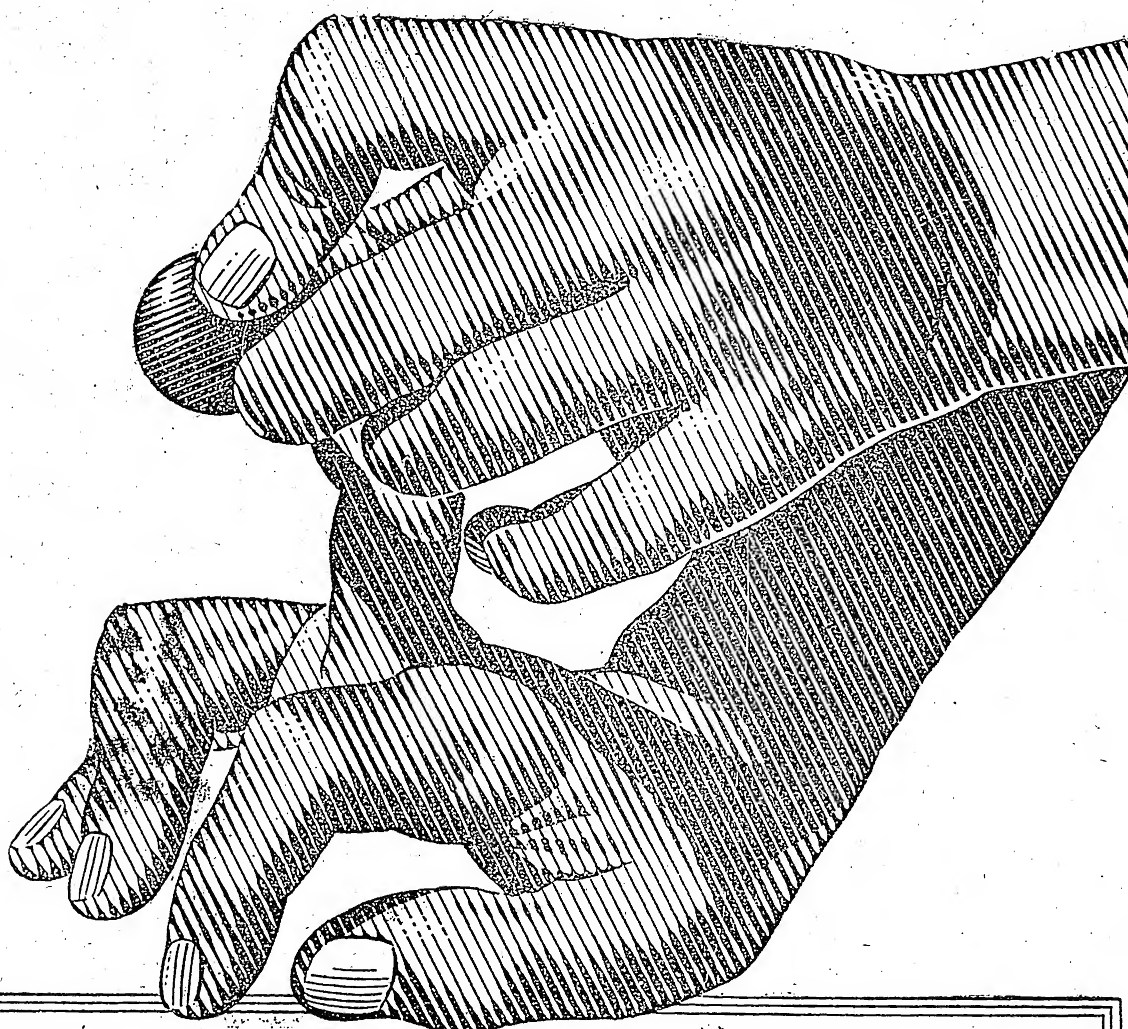
I was interested to learn that the land which had been under vegetables for two years, had already a heavy residual dose of manure needed for the crop of vegetables. Even so 15 cartloads of farmyard manure had been added towards the end of August. Three months after the wheat had been sown, 1½ maunds of ammonium sulphate was used.

Irrigation is by pumping sets, and for purposes of watering, the field was divided into eight smaller plots. Six waterings were given during the growing of the crop, almost at monthly intervals. The first irrigation was on November 10; then one each in mid-December, mid-January, mid-February, mid-March and the last in the first week of April. Two hoeings were done, the first after the first watering and another after the second irrigation. During the growing period, there was one rainfall of about three inches. The principle that was followed in irrigation, I learnt, was to keep the land always moist especially during the ripening of the crop. Although wheat variety C 518 withstands lodging because of its strong straw, even so when the crop was about 1¼ feet high, the top 3" or so were cut,

(Continued on page 19)

There are 60 acres of cotton ready to be picked





Hints to the farmer:

Sugarcane

1150 md. cane crop raised at the I. A. R. I. New Delhi.

By **P. C. RAHEJA**

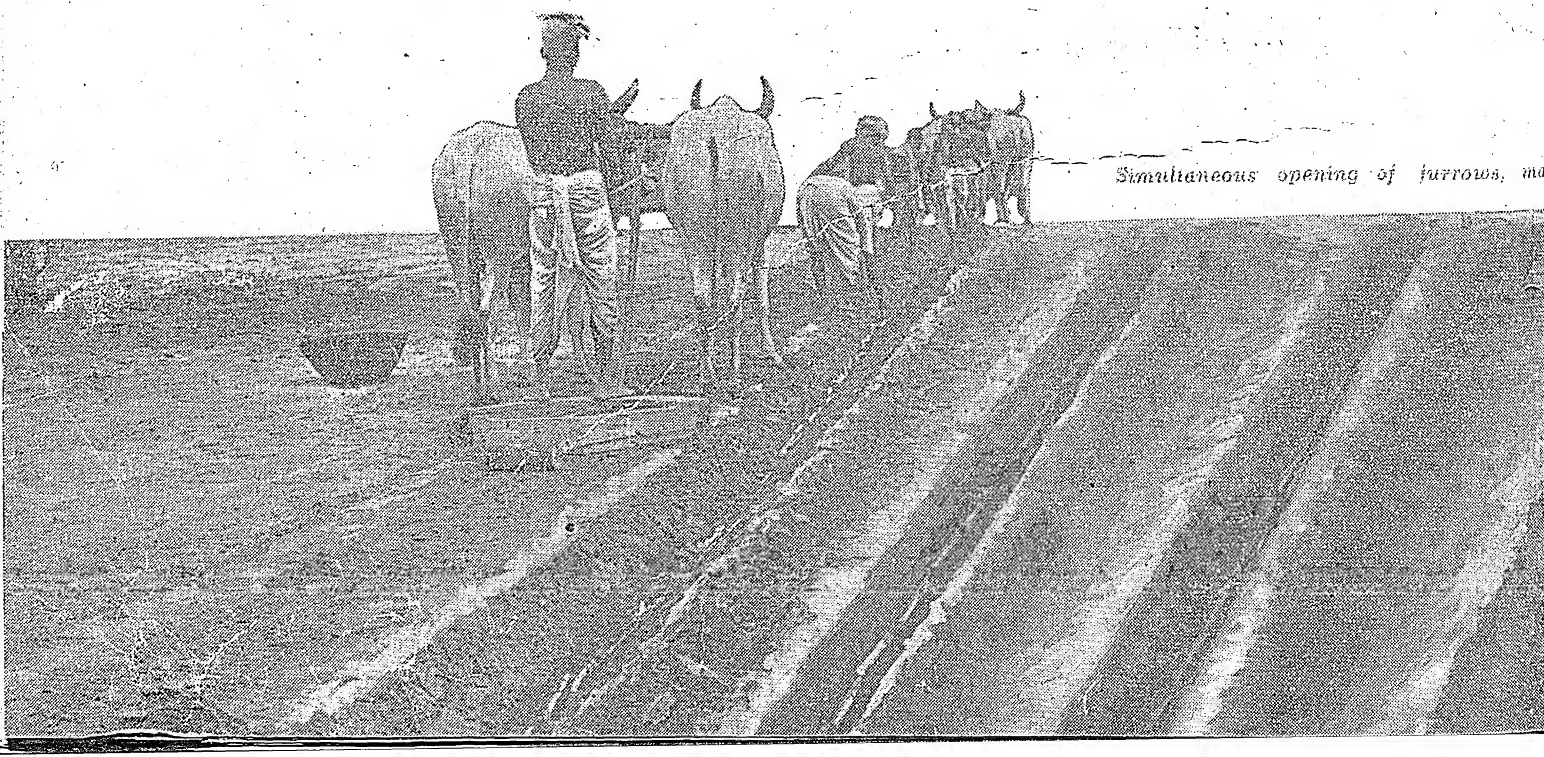
Division of Agronomy, I.A.R.I., New Delhi

THE introduction of hardy Coimbatore canes has rather led the farmers to relax their efforts at growing the crop with the needed attention and care. Consequently, the cane grown is of inferior quality and gives lower yields. The net profit accruing to the cane grower is less than what it could be with a little more care and a small extra expenditure. Cash crops give handsome returns if they receive proper attention at the hands of the farmers. This note purports to place information in the hands of cane growers to improve their system of cane cultivation.

SOIL AND CLIMATE

Sugarcane generally requires a rich land. It is the inherent fertility of the land rather than the texture of soil that matters. Loamy to clayey soils are suitable for its cultivation. The growth is luxuriant on well

Simultaneous opening of furrows, ma



drained lands. On waterlogged or unaerated lands asphyxiation of the footsystem leads to browning of leaf tips and retardation of cane growth. Well drained lands, containing high organic matter, suit this crop admirably. Saline or alkaline soils are less suitable although cane is sufficiently tolerant to alkalinity in the soils. On acidic and laterite soils the growth remains stunted though the quality ratio is very high. In India, concentration of the area under cane is highest in the north alluvial plains. Cane is grown on garden or canal irrigated lands in the South.

Cane for good germination requires a wide range of alternating temperatures with a mean of 80° F. Low atmospheric humidity coupled with high soil moisture is conducive to profuse tillering of cane. In the formative stage monsoonic conditions favour rapid growth. Improved juices result from hot days and cool nights. In northern India, cane planted in February-March starts tillering late in April and continues to tiller till the end of June. The rapid growth starts with the break of monsoon and progresses on upto the middle of September. Thereafter, the cane starts maturing. It is fully ripe by mid-January. The ratoons mature late in November or early December. In southern India, the crop season lasts from 18 to 24 months. The temperatures are more equable and it takes considerable time for the crop to mature. Consequently, the yields of cane and sugar are high.

SUGARCANE VARIETIES

The Coimbatore canes occupy over 80 per cent of the cane area in India. The regional distribution of cane varieties is given hereunder:

Uttar Pradesh : Over 50 per cent of the total cane crop of India is grown in this State. From varietal distribution point of view the State has been divided into three zones, viz. (*a*) western zone: Co. 312 holds the field in the Meerut and Bareilly Divisions. Other varieties introduced are Co. 453, Co. 313 and Co. 244; (*b*) central zone: About 37.2 per cent of the cane area is covered by Co. 312. It is being replaced in Lucknow and Rohilkhand Divisions by Co. 421 and Co. 527. The old varieties persisting are Co. 290 and Co. 331; (*c*) eastern zone: In the Gorakhpur Division Co. 313 and Co. 453 are the dominant varieties. Recently introduced varieties are Co. 421, Co. s. 109, Co. 393, Co. 370 and Co. 356.

Interplanted cane in shaftal (Trafolium rasupinatum) *crop*

Bihar : There are two separate regions in Bihar, viz. (*a*) north Bihar: The trans-Ganga tract extending upto the boundary of Nepal grows Co. 313 to the extent of 35.2 per cent. The mid-season varieties recommended are B. O. 11, Co. 453 and Co. 513; (*b*) south Bihar: Co. 453 is rapidly replacing Co. 331 and now occupies 56.6 per cent area. Other varieties approved by the Cane Department are B. O. 10, B. O. 11 and Co. 513.

Madras : The best variety in performance is Co. 419. Varieties Co. 527 and Co. 421 are recent introductions.

Bombay : In the Deccan canal tract Co. 419 dominates and covers over 70 per cent of the cane area. Similarly, in Gujarat also over 60 per cent of the area is occupied by Co. 419. This variety has replaced Pundia, P. O. J. 2878 and Co. 290.

Hyderabad : The Cane Department recommends Co. 419 and it now occupies 55.2 per cent of the cane area. Other varieties under cultivation are Pundia, Co. 290, Co. 213 and P. O. J. 2878.

Punjab : The main season variety, for *gur* as well as factory area is Co. 312. Varieties Co. 421 and Cos. 9 are being recommended to replace Co. 312, Co. 213 and indigenous canes.

Orissa : The new varieties Co. 419 and Co. 421 are rapidly replacing Co. 213 and indigenous canes.

planting and covering up setts with the gatherer. End to end planting of cane setts in furrows

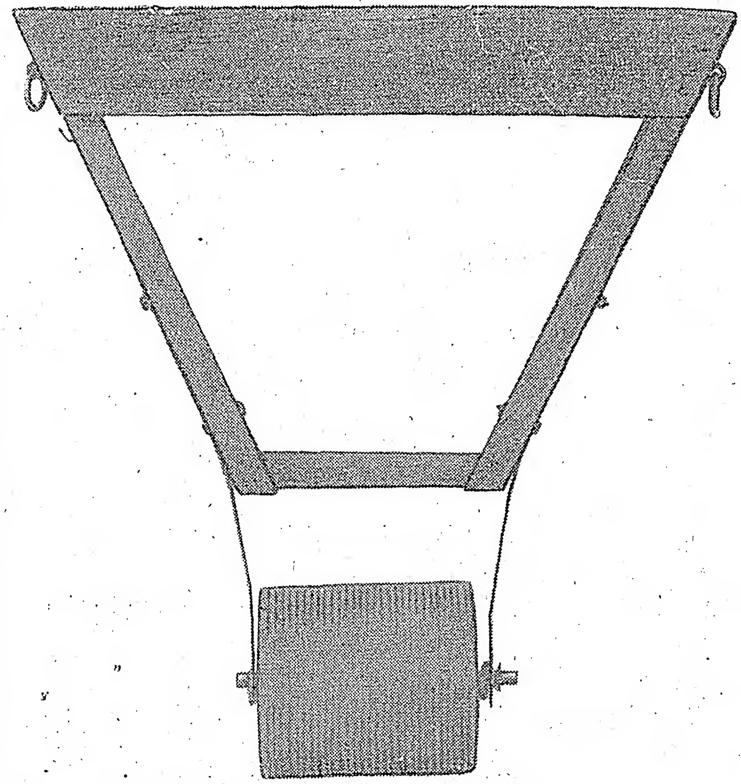
West Bengal: Varieties Co. 213 and Co. 313 were introduced about 15 years ago. Now the Department of Agriculture is replacing them by Co. 421 and Co. 527 for mid and early seasons, respectively.

Delhi: At the Indian Agricultural Research Institute, New Delhi, the performance of Co. 647 has proved superior to that of varieties Co. 453, Co. 312 and Co. 421. Tests with it in villages, as superior *gur* cane, have shown promise for its introduction to replace Co. 312, the dominant cane of the region.

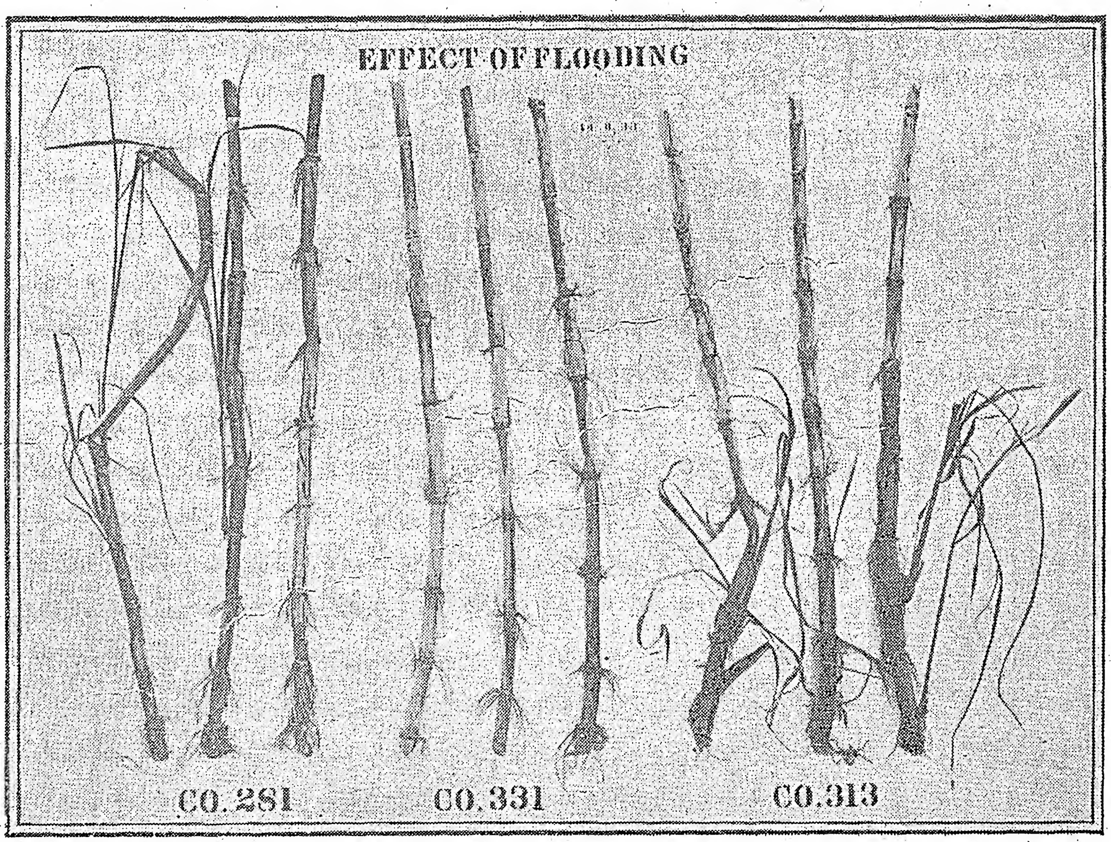
PREPARATORY TILLAGE AND CULTIVATION IMPLEMENTS

Preparatory tillage naturally depends upon the preceding crop and method of cane planting. In most parts of India land lies fallow. Good cane growers green-manure the field during the monsoons. Fallow lands should be given repeated cultivations during monsoon and post-monsoon seasons as and when the land is fit to be cultivated. Experimental results at the Indian Agricultural Research Institute, New Delhi, have shown that ploughing deeper than 6 ins. is of little advantage. Repeated shallow cultivations should be given to the land where a sugarcane crop is to be raised. The green-manured land should not be disturbed till about the middle of October when it should be opened and given 6 to 8 cultivations prior to cane planting. This gives a firm seed-bed suitable for good germination and the plants can draw food from large open soil mass which retains more moisture than is otherwise possible. For preparation of cane lands it is advisable to have a furrow turning plough. This is also useful in turning a green manure crop and breaking stubble of *jowar, bajra,* maize and sugarcane. If it is a light soil, light furrow turning ploughs of the type of Meston, Watts or Allahabad will do whereas Victory or Raja ploughs are more suitable for heavy lands. For subsequent cultivations of alluviums *desi*

(*Continued on page 22*)



Gatherer, used to cover the setts with earth from ridges



Damage to seed cane caused by water submergence

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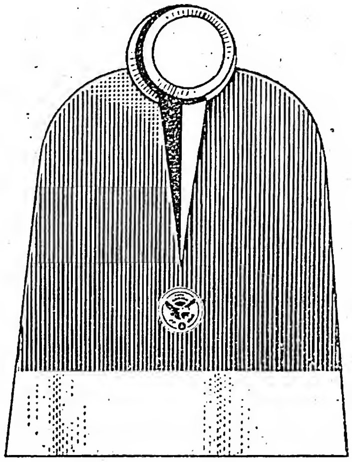

West India Pawrah

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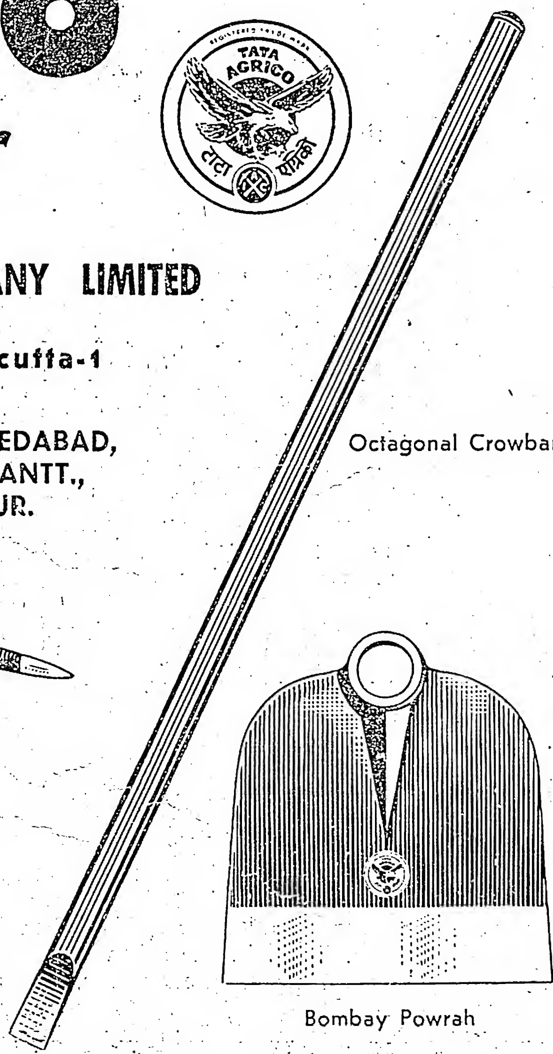

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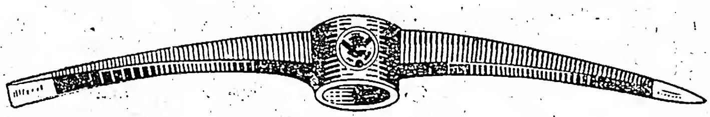

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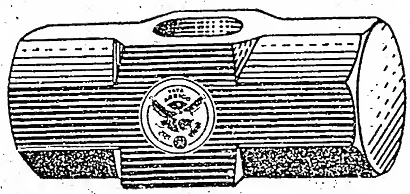
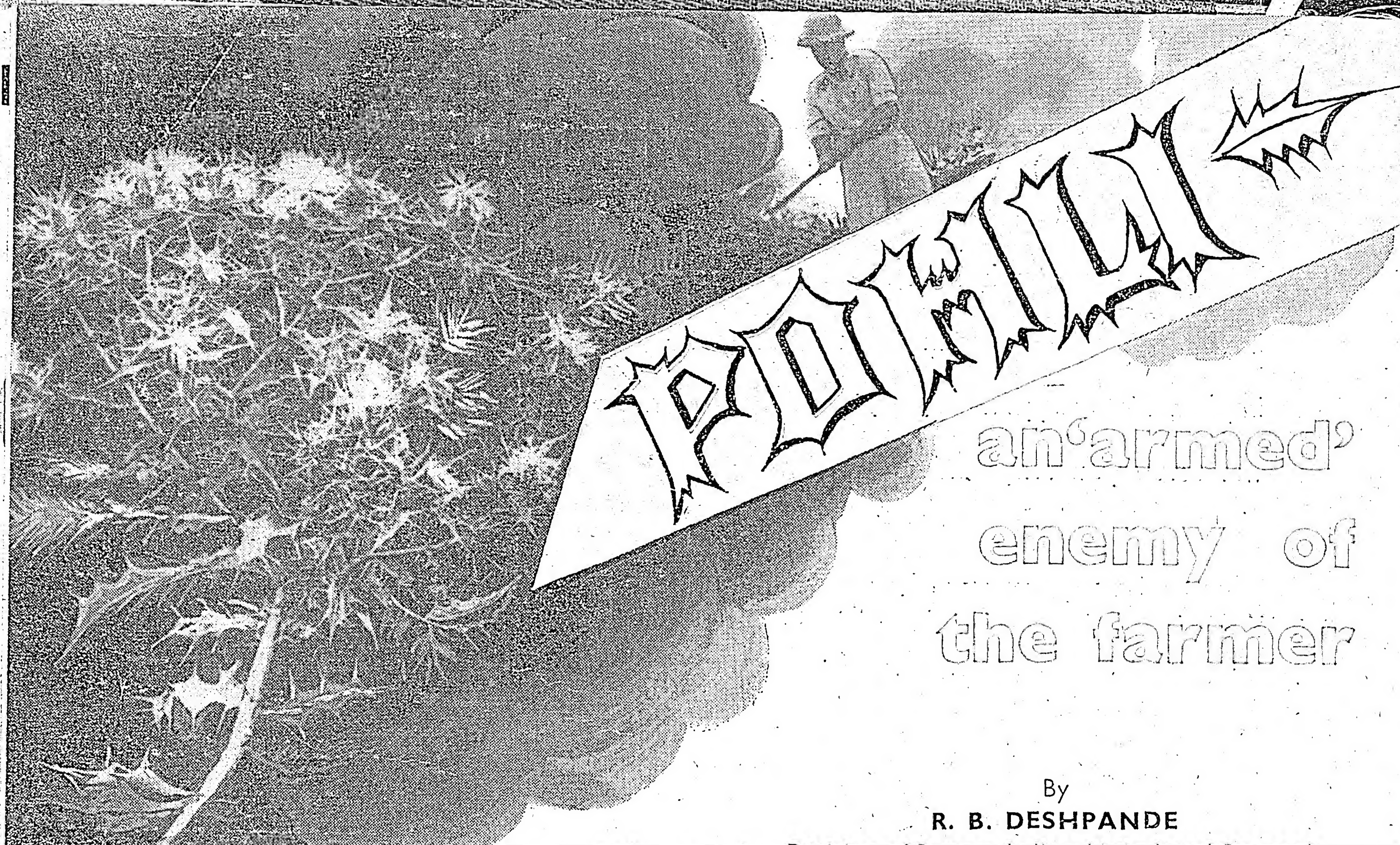


Double-f ... dge Hammer

Bombay Powrah

A.G. 3417



POHLI
an 'armed' enemy of the farmer

By
R. B. DESHPANDE
Division of Botany, Indian Agricultural Research Institute, New Delhi

POHLI is the wild form of *kusum*, or Safflower, one of our oilseed crops. Some of its vernacular names are *karar*, *poliyan*, *kantiara*, *kandiari*, etc.

Pohli is found in abundance in many of the drier parts of northern India. It is commonly found in the Delhi State, some areas being highly infested. For instance, if one were to go along the Rohtak Road a few miles from Delhi in April-May one would see on either side of it pale yellow patches, or even long stretches of vegetation. This is *pohli*.

The *pohli* perpetuates itself afresh annually through seeds and is very hardy and can complete its life cycle under very low amount of soil moisture. The plant is very spiny, except in its early stages. The foliage is pale green and the flowers pale yellow. The seeds are small, elongated, tapering at one end. The *pohli* is likely to be mistaken for the Mexican poppy. The latter, however, has greenish white leaves, is less branched and possesses flowers with much larger petals. The seeds resemble those of mustard. The seed colour varies from white to jet black. Mottled seeds have also been observed. The oil content is about 28 per cent.

The *pohli* is a noxious weed of the winter crops, e.g. wheat, gram, etc., and like all other weeds it draws on the plant food and moisture in the soil, which are intended for the crop. The weed, moreover, tends to suppress the growth of the crop plants by overgrowing or completely smothering them. Being spiny it interferes with the harvesting of the crop and is often left alone by the farmers. Some plants, however, get harvested and threshed along with the crop in which they grow, and thus their seeds find their way into the seeds of the crop, thereby lowering their value. Through sowing such seeds the weeds spread and multiply. The *pohli* weed has been found to reduce the yield of wheat and gram to an extent varying from 5 to 40 per cent. in the Punjab districts.

Pohli seedlings usually make their first appearance in the cultivated field from about the middle of November. The plants are spineless in earlier stages and are, therefore, easy to handle. At this stage they can be fed to cattle or even used as a vegetable. This is,

The IARI Land Army tackling 'pohli' plants in Qamruddin Nagar village near Delhi

The Land Army feels pleased at the heap of 'pohli' they have been able to gather in a short time

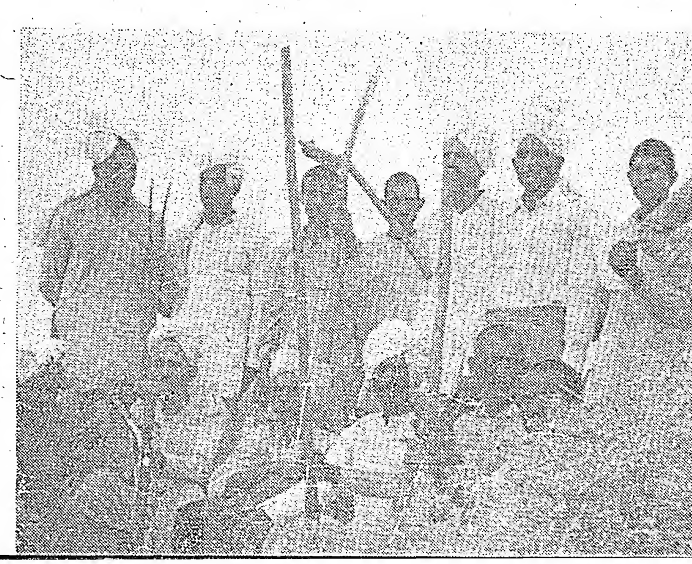
therefore, the best stage at which the *pohli* plants should be removed. The cultivators should make it a point to hoe their *pohli* infested fields so that not only would the *pohli* plants be removed, but the crop would also be benefited by it. If the *pohli* is not removed at this stage, it develops spines and becomes very difficult to handle. Moreover, it will later flower and set seed and may infest not only the same field afresh but many other fields, and hence the desirability of removing the weed in the seedling stage, or at any rate, before seed setting. If *pohli* escapes attention at the seedling stage, it should be harvested along with the crop itself. The *pohli* plants should be collected and burnt so that the seeds are destroyed or at least their power to germinate is lost. It is often observed that owing to the plants being spiny the cultivators do not touch them at the time of the harvest. For this reason, a *pohli* infested crop should where possible be harvested with a reaper. The *pohli* plants which have escaped removal at the first operation or at the time of harvest should be removed and collected in heaps in suitable places, before they are dead ripe, and burnt. When dead ripe, they are easily broken at the base and blown by wind to long distances dispersing the seeds and thus infesting fresh areas.

The *pohli* weed problem, therefore, is a serious one and needs to be tackled systematically and with concerted, continuous efforts. This is not a job for one isolated cultivator. The problem can only be effectively tackled if all the cultivators of a village, irrespective of whether their lands are infested with *pohli* or not, join hands in the war against this noxious weed. There should be cooperation not only between the cultivators of a village but between villages themselves. The campaign against this weed must be carried out at least for about four or five years continuously in order to have lasting effect. The cultivators should arrange '*pohli* eradication week' periodically and it should be made obligatory on all the villagers to take active part in the campaign.

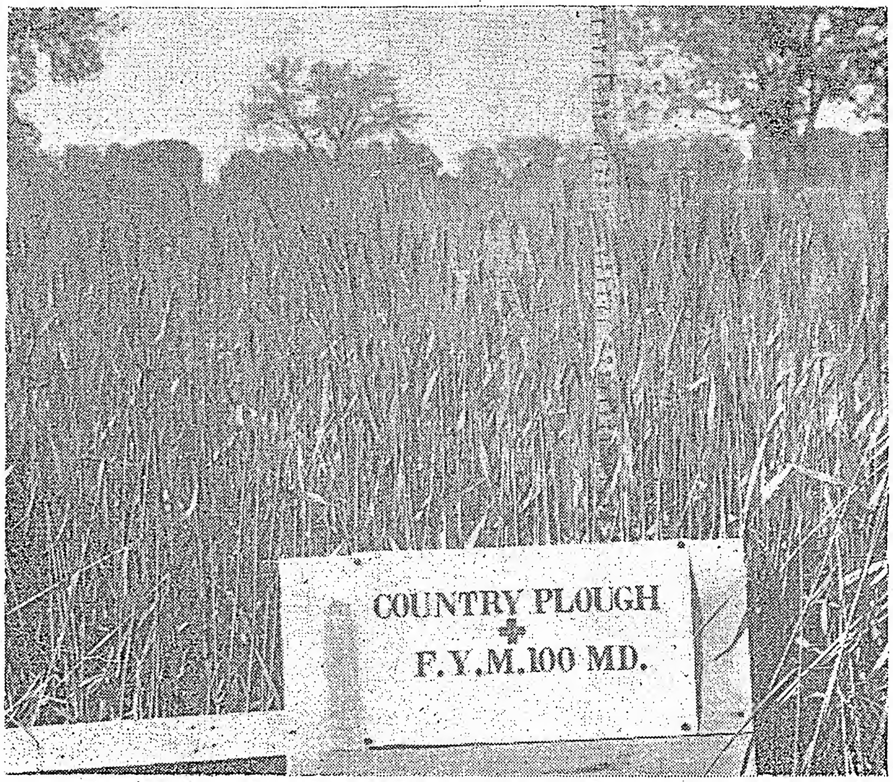
In order to stimulate the interest of the cultivators in the campaign, competitions should be organized and rewards offered to individual cultivators, and also to villages taking the keenest interest in the eradication of the *pohli* weed. If, however, for any reason the campaign is not effective, the State governments concerned should enact legislation as the Punjab Government have done.

The Indian Agricultural Research Institute took steps to bring home to the cultivators of certain villages in the Delhi State the seriousness of the *pohli* weed problem and to impress on them the necessity of organizing a regular campaign against it. The various Land Army units of the I. A. R. I. went into action in the Nangloi village in the month of May this year, and showed to the cultivators how effectively the problem could be tackled collectively. On the first occasion, Shri K. M. Munshi was present and expressed satisfaction at the way the war against the *pohli* weed, one of the worst 'armed' enemies of the villagers, had begun.

Villagers took keen interest in the 'pohli' eradication campaign



PLOUGHING IS MANURING



Good crop of wheat obtained at the I. A. R. I.

By **A. R. KHAN** & **B. P. MATHUR**
Division of Agronomy, Indian Agricultural Research Institute, New Delhi

SO goes the adage. There is a lot of wisdom in these proverbs. Also there are many traditions connected with them. Farmers, confident of the art handed down to them by their predecessors, have attained a high standard of perfection in 'cultivation'. The tillage tool of today would be recognized without difficulty by the farmer of two centuries ago. He would immediately recognize the actual operations. The tiller still believes in practising a series of operations to produce dust-mulch the so called 'tilth'. Tillage is still the most costly single item in arable farming.

Yet, there is another school of workers who advocate the abandonment of ploughing and want to know the scientific background in support of this practice. Though a large number of experiments have been done on manuring during recent years, the tillage experiments recorded in literature are relatively few. This is, perhaps, because tillage is so universal that it has been taken for granted to be carried out without further scientific knowledge.

The matter, therefore, needs further exploration; especially the necessity for reducing tillage cost, as affected by the depth and frequency of cultivation, is obvious.

FIELD EXPERIMENTS STARTED

In order to obtain an answer to the query raised above extensive field experiments are under way on the farms of this Institute for more than a decade. The results arrived at or indicated by these studies are summarised below :

DEPTH OF PLOUGHING

In the past deep ploughing was strongly advocated and many experiments were conducted all over the world to determine the optimum depth of ploughing. Similar work was started here. The conventional method of cultivation, 4 to 5 inches deep, by the local 'country' plough with an initial ploughing

by a soil inverting one was compared, after doubling the depth, with tractor plough followed by implements (cultivator and disc). In general it was found that shallow depth of ploughing as obtained by 'country' plough is the most practicable depth to plough. Deep ploughing doesn't pay. These findings are in general agreement with results obtained in other parts of the world.

FREQUENCY OF CULTIVATION

Considerable work has been done on the frequency of cultivation of wheat and maize in the Institute. I wish to mention here the work on wheat. From an investigation where a frequency of 3, 6, 9 and 12 cultivations with 'country' plough was maintained, the best results in general were obtained from plots which received 9 cultivations. It may, therefore, be safely concluded that just enough cultivation, and not the abandonment of it, to keep down weeds and maintaining soil in a receptive condition to absorb rainfall, is the most efficient cultivation. Anything in excess of this bare minimum is superfluous and must be avoided. Timely cultivation, and not frequent cultivation, should be the ideal.

RESULTS TESTED

The above results derived from experimental plots, were tested on a field scale this year. An acre of land with average fertility was selected and sown with wheat. The crop came up nicely. It was, however, damaged badly by hail on the 1st March, 1952. The yield of grain obtained from this field was 25 maunds 3 seers. This would have gone up to 39 maunds (on the basis of samples drawn from the remaining patch of standing crop) had there been no hail. However, for the purpose of calculation, the actual yield has been taken and not the one estimated.

An idea of the expenditure and receipt may be had from the following statement :—

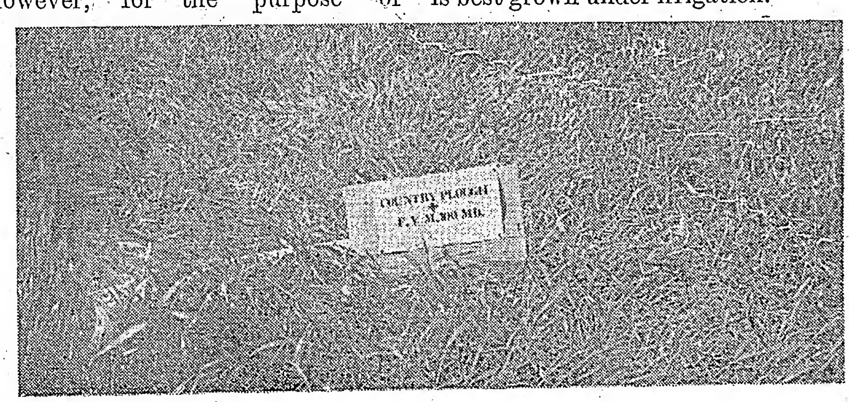
Outlay operation	*Amount* Rs.	a.
Ploughing and preparation land (9)	63	0
Manuring *plus* spreading (5 carts)	28	0
Sowing *plus* cost of seed ..	20	0
Irrigation & labour (2) ..	28	8
Harvesting, threshing ..	87	8
Total ..	227	0
Return		
Grain—25 md. 3 sr. @ 14/6 per maund	360	8
Straw—62 md. @ 3/14 per maund	240	4
	600	12
Saving	373	12

Note :—The above figures are based on farm rates.

As will be seen from the above statement, a little skill, in doing the job just enough and timely, can do a lot of good to the farmer. Not only can he reduce expenditure on tillage, but he can also avoid a serious situation resulting from indiscriminate cultivation into a 'dust bowl'.

There should, not however, be any misunderstanding about the place of tractors in farm economy. They are invaluable for cheapening production and doing the job timely. The only care we should take is not to use them for deep ploughing under ordinary circumstances.

The above method would apply to 'loamy' soils of northern India with semi-arid climate where wheat is best grown under irrigation.



Crop damaged by hail

....and perfumes too

By
HANS E. KARDEL

THIS is a story about grass but not the customary varieties with which we are generally familiar. It is not a fodder variety but is grown for extracting valuable oil which is used in making sweet smelling soap, vitamin "A" pills, or fragrant perfumes of the best French selections.

My first introduction to lemongrass took place when Mr. G. N. M. Pillay, Manager of the "Kelly Plantation," Malabar, Madras State, brought a basketfull to our office in the Department of Agriculture, Bangalore. He also brought 24 samples of soil from the 1,000 acre area now being developed for lemongrass production to find out about fertilizer requirements and improved cultural practices.

At a dinner engagement with Mr. John Willing, Executive Director of the Wynaad Essential Oils (India) Ltd., which also operates the "Kelly Plantation," we were requested to visit the farm. "We" means, Dick

Left to right:—Dick Fagan, Ext. Specialist, Mr. John Willing, Mr. Pillay, Farm, Manager, looking over Map of Farm

—Hans Kardel looking over pineapple plantation near Wynaad

the source of sweet smelling soap

Lemongrass-

Fagan, my partner here, a former Montana Agricultural teacher, and myself. A few weeks later, following an afternoon tea at the Willing residence, we left by car for the Wynaad district.

Travelling south-west, a beautiful June day over winding black-topped roads, our first stop was at Mysore City, about 80 miles from Bangalore. The road between Bangalore and Mysore City is lined with stately banyan trees. Many of the branches grow long roots, reaching towards the ground, and often, form a new tree when ground contact is established. Driving on this road at night reminded me of scenes from the movie "Snow White and the 7 Dwarves." The fields vary from gently rolling to steep and badly eroded slopes. Farmers were out plowing with their bullocks and ancient wooden ploughs. Rain was badly needed in order to start planting the very important Ragi crop. Ragi is a food millet which, together with rice form the main diet of the village folks. We also passed some irrigated areas with promising rice fields, and proceeded towards Mysore's fertile river valleys decked with majestic coconut palms.

About 59 miles from Mysore we stopped at the Madras State border in a densely wooded area to pay toll. "We ought to see some elephants or tigers to night," Mr. Willing commented. "Last time we drove through this jungle a huge elephant blocked the road. We stopped, turned off the motor and sat there scared stiff, hoping he would not tip our car over."

Agricultural Inspector in-charge of resettlement of former soldiers, Wynaad

Mr. Pillay and his bearer

Workers waiting for their pay

However, that didn't happen this time and we were disappointed not to see any big game that evening.

Early next morning looking out of the window we agreed that this was the most beautiful spot we had seen in India, and for the first time, we saw lemongrass fields. That morning we walked 6 miles up and down the slopes, observing the growth of the grass, securing more information, and becoming convinced that no tractor made to-day would be able to navigate on this type of terrain.

About 600 acres of the Kelly plantation are in lemongrass. It was hard to comprehend that all of this land, except 4-5 acres, had been hand-worked in order to bring it under cultivation. Most of the grass was seeded by hand and the seed covered by children who literally take the soil with their fingers. In other parts, the grass was transplanted on the steep slopes to cut down serious erosion. About 170 workers, mostly women and children, are continuously engaged in weeding. Large fern and elephant-grass are the most troublesome weeds. We observed about 50 women who were just starting the harvesting operations. They worked in a group cutting the grass by hand with a sickle (*arruval*). They are paid by the "pidi." A "pidi" is a handful of grass tied together with a spear of grass. These small bundles are placed in rows for easier pick-up. About 800 "pidis" form a day's work. The wages are about one rupee per day. Five to Six crops are harvested each year. The average annual rainfall is 140 ins. Heavy rainfall accompanied by strong winds, is common during July. Last year 13.8 ins. were recorded on July 23rd. and 13.4 ins. on July 24th. As a soil conserver on these long slopes, lemongrass is natural.

A narrow, winding road has been built around the slopes. A tractor and two trailers are used for hauling the green grass to the processing plant. The whole area was at one time a coffee plantation and few coffee bushes are still left in places. Boulders, scattered teak, rosewood, and gooseberry trees also adorn the landscape and add to the problem of farm mechanization.

The trunk of a gooseberry tree reaches a diameter of 18 ins. and a height of 30 ft. The berries are used for medicinal purposes, pickles, and curry.

The processing plant consists of six stills each with a capacity of 700-900 lb. of grass. Wood is now used for fuel, but modern oil burners will soon replace the old wood burners. The grass is kept in the still for about two hours. The oil is directed to a water-cooled aluminium condenser with coils about 25 ft. long. A spring, located about 85 ft. from het plant, provides water for the operation. The "spent grass" is returned to the soil as a source of organic matter. The whole process reminded me of the Mint processing in Eaton Co.

An many as 1000 men and women are employed at the peak of the harvesting season. A new one-storey brick building, 28×81 ft., with tiled roof is under construction to house six families of the regular field work crew. This will be a big improvement over present housing which consists mostly of one room mud huts with coconut palm leaves as roofing.

The Wynaad Company provides a doctor, who lives on the Plantation, and free medicine and housing. The workers are allowed 14 days' sick leave annually. Each worker is also provided with a blanket each year. The women average Re. 1 per day and the men Rs. 1-8-0 (E—rupee equals 16 annas and about 23 cents in American money). The men work mostly in the processing plant, and at road building and land clearing.

The extracted oil from each field is tested in a modern laboratory and detailed records show date of cutting, tonnage, weather conditions, time between cutting the grass and processing, and, perhaps most important, the citral content of the oil and yield per acre.

The Cymbopogon Flexuosous variety of lemongrass is grown exclusively and the extreme care in hand-weeding and cutting ensures a high quality product.

A big task has been accomplished since Mr. Willing and Mr. Pillay (old army friends) began clearing the mountain side and planting lemongrass in February and May 1951 respectively.

About 6 P.M. we were near a dense jungle and we suggested it would be interesting to cross this jungle to reach the next field. "Let's turn around," advised Mr. Pillay. "We are not armed and in that strip of jungle we might face unfriendly tigers, panthers, or elephants, not to mention poisonous snakes." Needless to say, we followed his advice. "Did you ever consider using sheep as weeders?" I enquired, while strolling home-ward on the narrow path. "Back in Michigan commercial strawberry growers use geese as weeders and find it very practical, but that lemongrass tastes pretty strong and I doubt if sheep would eat it." "That's worth looking into" replied

(*Contd. on page 31*)

MEN OF THE MONTH

(*Continued from page* 6)

because of a fear of lodging. At the time of harvest on April 14, the crop stood 5 feet high. The yield was 71 maunds 23 seers and 10 chhatacks. The expenses on growing the wheat were about Rs. 350 per acre and the income from the sale of wheat and fodder totalled Rs. 1120.

THE LAST SEASON

I watched the bullocks ploughing the fields which were getting ready for the next *rabi*, and I asked my new friends what their plans were for the utilization of the land during the next season. In a tone of resignation which I could not miss, they said: "This is our last season; the lease comes to an end next year. In any case we shall put 100 acres under wheat, 40 under fodder crops, and 20 acres each under vegetables and gram."

It was difficult to believe that all the efforts of my friends during the past few years were to come to naught because the lease expired in 1953. The subject was painful, but I pursued it. "Surely, the landlord will renew the lease ?" I asked.

"The price of renewal rises almost daily" said the younger of the partners. "Some time ago, it was Rs. 20,000 a year, now we hear he wants Rs. 30,000. This of course, we cannot afford."

Sardar Ajit Singh the older of the partners continued where the other had broken off. "If we were assured of another spell of lease, there is so much we could do to improve the land. We could make the water channels *pucca*, try further experiments in rotation of crops, grow better varieties of wheat and cotton, and do so much more besides. We found this place a wilderness and through our sweat and toil have made it a truly model farm. Now we are being asked to quit."

As I rose from the *charpai* on which we had all sat together and carried on the conversation, and prepared to go, I asked my hosts one final question. "What will you do if you have to leave this farm next year ?"

"We will fight for staying on but if we fail, we shall seek new land to carry on the work we have begun." There was no mistaking the determination in their voice. I feel sure that wherever these Sikh farmers go, whatever lands they cultivate, they will always come out on top, for farming is in their blood.

ANNOUNCEMENT

The Indian Central Arecanut Committee has decided to award a prize of Rs. 2,000 for the invention of a time-saving machinery for husking and slicing arecanut. The details of the prize may be obtained from the Secretary, Indian Central Arecanut Committee, P. B. No. 14, Kozhikode (Calicut), South India.

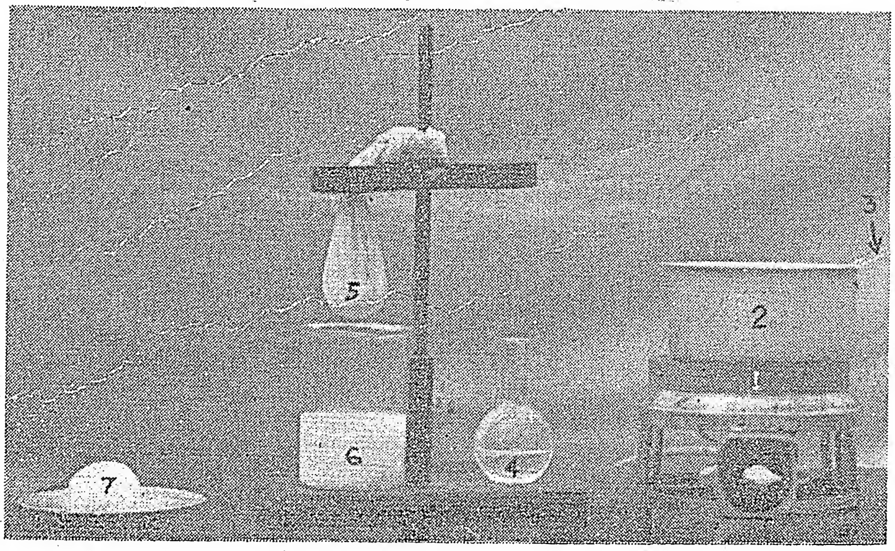
MILK and its Products

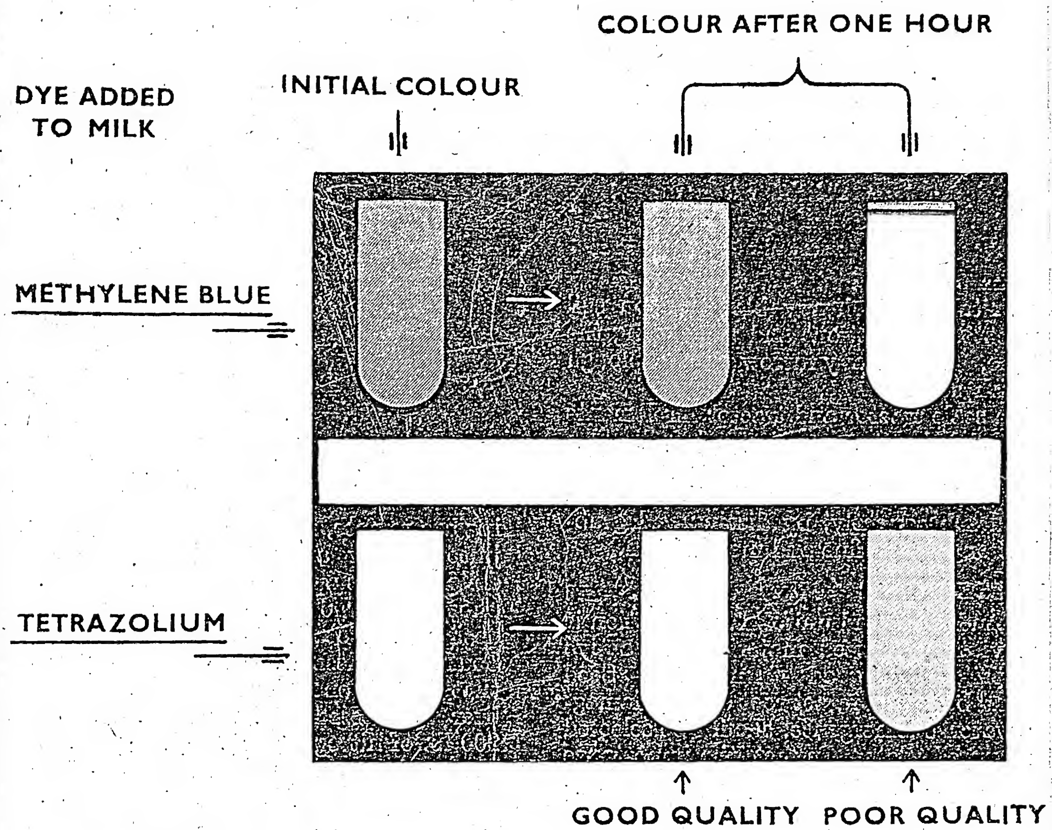
By **C. P. ANANTAKRISHNAN**

THE bacteriological quality of milk is of considerable importance in dairy industry because it gives an index of the keeping quality of milk and its suitability for processing. A reliable idea of the quality of milk can be obtained by the addition of certain dyes (which colour the milk blue or purple) and then observe the time taken or rate at which decolourisation of the dye takes place (which is roughly proportional to the numbers of active organisms present in milk). There are two dye reduction tests in vogue wherein either methylene blue or resazurin is used. Recently, a new test has been developed at this Institute using a colourless compound known as "tetrazolium bromide". This compound imparts no colour to the milk initially. If the milk contains large numbers of bacteria, it becomes deep red in colour and the time it takes to produce this colour or the intensity of colour measured after a known interval of time (say 4 hours or so) enables one to estimate the quality of milk. This dye offers two distinct advantages over others in use upto now. Firstly, the change from the colourless to deep red colour is easy to observe and quite impressive for demonstration to the milk producers. Secondly, the dye can be used even in heat processed or boiled milk unlike methylene blue and resazurin. The results of tetrazolium test indicate that it may become an important test in the quality control of milk supplies in our country.

Chhana is one of the two chief bases (the other is *khoa*) for making Indian milksweets. It is obtained by acid-coagulation of milk at its boiling point and subsequent drainage of whey. The amount of milk annually converted into *chhana* in the Indian Union has been estimated at 15–16 lakh maunds. The production of *chhana* is confined to the eastern States of the Union, especially West Bengal, which produces the maximum quantity of this product. In view of its important economic position in the dairy industry of the country, investigation has been carried out to define factors in *chhana* manufacture which will ensure marketing of a desirable product. Different types of *chhana*-sweets need in *chhana* particular type of softness. The degree of softness is proportional to the amount of moisture the product contains and is essentially decided by the conditions of coagulation and the quality of milk used. The conditions of coagulation are determined by acidity at coagulation strength of the coagulant solution, type of coagulant temperature and time of coagulation, and lastly, the speed of stirring the milk at the time of adding the coagulant. A higher acidity at coagulation causes a decrease in the moisture content of *chhana* and an increase in its hardness. With lower acidity, the effect is reversed. Commercial citric and lactic acids produce odourless products, while lime-juice and aged *chhana* whey impart in the coagulated product their characteristic flavours. A lower temperature of coagulation increases the moisture content while a higher speed of stirring decreases the moisture content of *chhana*.

CHHANA-MAKING EQUIPMENTS
1. Hotplate 2. 'Degchi' 3. Stirrer 4. Coagulant 5. 'Chhana' for draining 6. 'Chhana' whey 7. Finished 'Chhana'



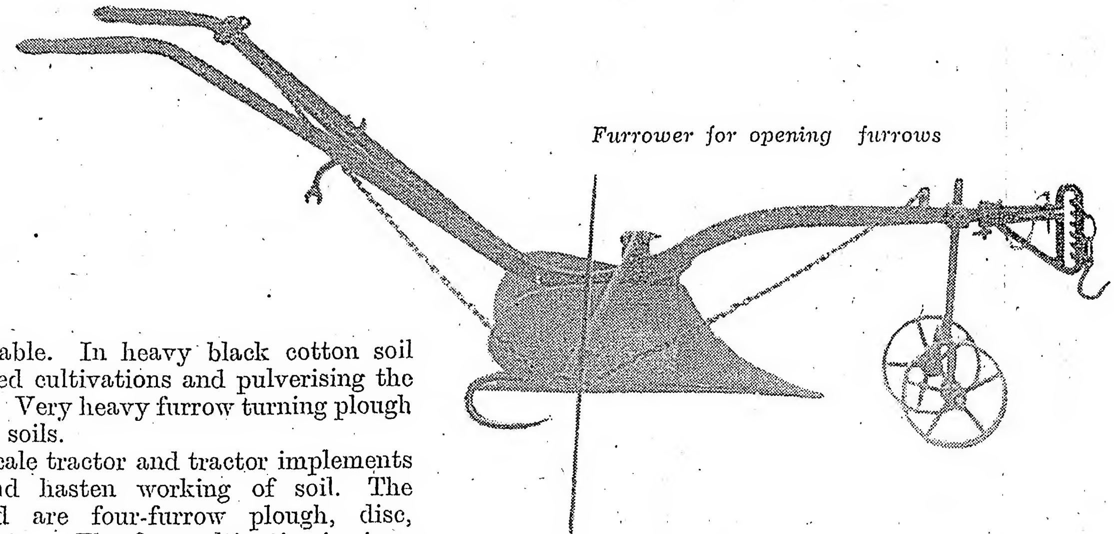


COLOUR CHANGES IN MILK (CONTAINING THE DYE) DUE TO BACTERIAL ACTIVITY.

For *chhana* making, cow milk is preferable, because it yields a product of desirable soft body and smooth texture. The milk for *chhana* making should be fresh and must have 4 per cent fat. Developed acidity imparts coarse texture and sour smell to *chhana*. The processing of milk has no untoward effect on the quality of the final product. Adulteration of milk with water lowers the yield of *chhana* without affecting its texture or flavour. The presence of starch in milk results in coagulation in a gelatinous mass, which is not suitable for sweet making. The yield of *chhana* from the milk of cow and buffalo is 13.8 and 20.9 per cent respectively. The keeping quality of *chhana* depends upon the temperature of storage. The average values for the storage life of *chhana* at 100°, 75°, and 45° F. are 2, 3 and 12 days respectively.

Colostrum is the secretion obtained from mammals during the first few days after parturition. After meeting the requirements of colostrum for the calf, particularly in heavy yielders, a good amount of colostrum is usually left over. Preservation of this valuable product as such in the powder form is ideal, but the process of drying is cumbersome and not within the reach of an ordinary farmer. However, the fat from the surplus colostrum could be easily recovered by mechanical means and stored for a considerable length of time. The composition of this colostral fat differs a great deal from that of normal milk fat. It contains smaller amounts of lower volatile fatty acids, but on the contrary, it is very rich in vitamin A and carotene. Experiments were carried out to study the growth promoting value of this colostral fat, perticularly in the raising of young calves. A group of young calves were fed colostral fat at 3 per cent level in skim milk from the age of 4 days at the rate of 6 lb. a day for 3 months. Another group of the same age was maintained on normal milk ration as control. The growth was measured in terms of increase in weight, height and heart girth at different stages. The total vitamin A intake of the experimental calves was about 18,000 i.u. per day as compared to about 3,000 i.u. per day in the case of control calves. This vast difference in the vitamin A intake made no significant difference in the growth rate of the two groups of calves. The results indicate that colostral fat at 3 per cent level in skim milk is a good substitute for whole milk in the raising of new born calves and this suggests the possibility of utilization of surplus colostral fat available in large farms, thereby saving an equal amount of milk fat for human consumption.

 (Continued from page 10)



Furrower for opening furrows

plough is quite suitable. In heavy black cotton soil a *bhakkar* for repeated cultivations and pulverising the soil is more suitable. Very heavy furrow turning plough is required for such soils.

On plantation scale tractor and tractor implements reduce the cost and hasten working of soil. The implements required are four-furrow plough, disc, harrow and a cultivator. The first cultivation is given with a plough and subsequently, by discing and grubbing, the field is brought to a fine and mellow tilth.

SELECTION OF SEED CANE

For a good stand early and uniform germination is essential. High vitality of seed material and active buds are prerequisites for good germination. Seed material with sound buds and intact root eyes undamaged by frost or water submergence, should be selected from the best manured plots. In fact, the importance of careful selection of seed material cannot be over-emphasized. The seed material should be selected when the crop is still standing in the field. Lodged and diseased canes should be rejected. Top setts should be preferred to bottom setts. These can be easily spared as juice from such setts brings about quick inversion and forms low grade *gur*. In case the varieties are susceptible to frost and frosts are frequent, the seed should be clamped. Strong healthy canes should be cut into setts varying from 1½ to 2½ ft. in length. These setts should be as straight as possible so that they lie straight on the furrow bottom. Diseased and discarded setts should be passed through the mill and the bagasse utilized for burning in the *gur* furnace.

About 50-60 md. of seed cane, cut into setts, are required for an acre when cane is to the planted at 2½ to 3 ft. interspace. The quality also depends on the thickness of cane.

MANURING

For a cane crop basal manuring is very essential. If the field has not been green-manured then a basal dressing of 10 tons of F. Y. M., composted garbage or farm compost should be applied. The dose of sludge may be halved as it contains higher percentage of nitrogen as compared to other basal manures. Basal manure must be thoroughly incorporated in the soil by repeated cultivations.

At the planting time, and subsequently, about 120 lb. of nitrogen, which in terms of ammonium sulphate amounts to 7½ md., should be applied as top dressing. In light soils, the dose should be split up. One half of it should be applied at the planting time in the furrow or trench, and the remaining half at earthing up of the crop. In heavy soils, where chances of leaching are remote, full scale application results in superior juice quality and higher cane yield. In phosphate deficient soils application of 1½ to 3 md. of triple superphosphate or 6 md. of single superphosphate is very desirable. Potash is deficient in very few soils in the South and Assam. One essential precaution is to see that there is enough moisture in the soil when the fertilizer is dressed. In southern India manuring upto 200 lb. of nitrogen per acre has given economic returns. Under those conditions split-up dose applications have proved useful. Hence the fertilizer should be applied in three doses, viz. at the time of planting, 6 weeks after it and at earthing up of the crop.

PLANTING

The choice of a planting method is of great importance to the farmer. The system has to be such that it fits in his cropping methods and is manageable with the means at his disposal. There are four recognized methods of planting cane viz. the furrow method, the trench system, flat planting, and the interplanting of cane in standing crops.

Of these four methods, the trench system is commonly adopted in areas where the crop stands on the field for a period exceeding 18 months. The furrow method is common with cane growers in northern India in the Gangetic alluvium. Flat planting is very commonly practised in the Indus basin. In intensive rotations cane is interplanted in *shaftal* (*Trifolium rasupinatum*), berseem (*Trifolium alexandrium*), potatoes and other vegetable crops. The standard furrow method (evolved at Pusa) consists in opening furrows 5 to 6 ins. deep with a furrower. Cake or fertilizer to be applied is spread at the bottom of the furrow before setts are placed. The fertilizer should be mixed with powdered compost or earth before it is spread in the furrow. In the furrows, setts are placed end to end and covered with earth by means of a gatherer. Thereafter, the field is beamed to press the earth on the setts. In flat planting, the furrows are hardly 2½-3 ins. deep as the *desi* plough can only pierce the soil to that depth. So, the setts are covered with a 1½-2 ins. layer of earth. The trench system is costly and requires considerable labour to lay out

the trenches $1\frac{1}{2}$ ft. in width and $3\frac{1}{2}$ ft. to 4 ft. apart from middle of one trench to the other. The topsoil is placed on one side and earth from the bottom 9 ins. is placed on the other. The setts are placed in the furrows after fertilizer has been applied and they are covered with a layer of about 2 ins. of soil. Usually, trenches are irrigated immediately after planting. The trench system is an insurance against lodging. Flat planting provides least support and requires a few more irrigations for germination. The furrow system of planting is cheap and more adapted to loamy alluvial soils with dry system of planting.

IRRIGATION

The experimental work has indicated that during the germination period water should be supplied more freely than during the period after germination and before earthing up of the crop. In the cane formation stage, the crop requires large quantities of water at weekly intervals, unless, the monsoon comes to rescue by supplying water at short intervals to the extent of about 45 acre inches. The water supply restricted in the maturation stage sweetens the cane. Wasteful irrigations increase the yield but do not proportionately increase the sucrose content and, therefore, in *gur* tracts heavy irrigations cause a definite reduction in *gur* yield and the setting of *gur* is adversely affected. Shallow, frequent irrigations, saturating the soil upto 6 ins. depth, are more profitable than deep irrigations. The latter causes leaching of nitrates with water beyond the root zone. The sugarcane crop requires about 60 acre inches of water in northern India and about 120 acre inches in southern India, that is 20 and 40 irrigations, respectively. The number of irrigations will decrease to the extent the rainfall supplements irrigation.

INTERCULTIVATION

Care given to the plant in the early stages of its growth pays handsomely in the shape of vigorous and ordered growth of the crop. Throughout India hot weather period is the most critical period for cane growth. Once the crop has tided over this period successfully it maintains vigorous growth thereafter. This period lasts for over three months and coincides with the tillering phase of the crop. The weeds compete with crop for water and nutrients. There is high rate of evaporation from the interspace between rows if soil crust is not broken. Hoeing or intercultivation conserves moisture and plant food by uprooting weeds and forming mulch on the soil surface. It also provides aeration for roots and thus stimulates growth of roots in deeper layers. After every irrigation the crop should receive hoeing. The intercultivation can be cheaply done by means of a bullock-drawn hoe or a cultivator. Some farmers neglect intercultivation during hot weather. The yields are always considerably increased with a slight extra care in the management of the soil in the dry period.

EARTHING UP

At present, earthing up is done with manual labour involving very high cost to the farmer. The operation can be more cheaply performed with a ridging plough or, alternatively, with a turning plough. The former carries out the operation very efficiently. It is given to lend support to the growing stalks which gradually increase in weight. The stalks give out new roots which further bind them to the soil. Furrow irrigation results in saving in irrigation water to the extent of 10-15 per cent. The crop is less bunchy and larger number of millable stalks are developed. It reduces incidence of the stem borer. The earthing up operation should be performed in the beginning of July, when first internode is visible and the crop stands up 4-5 ft. high. The operation should never be delayed beyond mid-July, otherwise, the stalks break in large numbers.

HARVESTING AND AFTER-CULTIVATION

In northern India, plant crop matures by about the middle of December, when it becomes fit for harvesting for *gur* manufacture or supply to the sugar factory. The ratoon crop matures a month earlier and is usually ready late in October or early November. The usual method is to harvest the cane flush to the ground. It is, however, recommended that a cane crop which is to be ratooned should be dug up with a spade. That adds appreciably to the yield. The topping of cane should be done right upto its part called green cane, particularly in the early part of the harvesting season when the top portion is unripe. Later on, in the month of March, absolutely immature stalks should only go with the tops. The cane for *gur* yard or factory should be cleaned of all mud and dry leaves otherwise, it causes considerable difficulty in *gur* manufacture and in the sugar factory.

At present, after-cultivation of the land is usually done with manual labour. The operation can be cheaply and efficiently performed with a furrow turning plough. Cross ploughing of the field uproots the stubble completely. This stubble should be picked up and used as fuel. After stubble removal, the land should be cultivated thrice or even four times with horse hoe or *desi* plough. When it is intended to keep the stubble for ratoon, two precautions are essential, viz. the mature crop must be harvested before early February, and secondly, it should be free from disease and pests particularly red rot and shoot borers. After harvesting, the dry leaves should be burnt, the ridges carefully ploughed down and land irrigated so that sprouting of buds starts immediately.

PESTS AND DISEASES

Pyrilla: It is a leaf sucking insect both in the nymphal and adult stages. When in epidemic form, it does extensive damage to the vigorous, healthy growing crops where it finds good shelter. Early attack arrests the growth of the plants and a late one brings about deterioration in juice quality. Bagging of nymphs and adults during May to July in the morning and evening provides considerable relief. Burning unwanted trash and stubble also destroys the pest.

Borers: Stem and shoot borers are serious pests of the cane crop. They bore the cane and spoil it. When serious, they kill all the shoots and produce dead hearts. The growth of the crop is stunted and there is little cane formation. Cutting out shoots showing dead hearts from the base removes the caterpillars damaging the shoots. This process requires repetition with weekly intervals. The releasing of *Trichogramma* parasites is another method of controlling pests particularly on large scale.

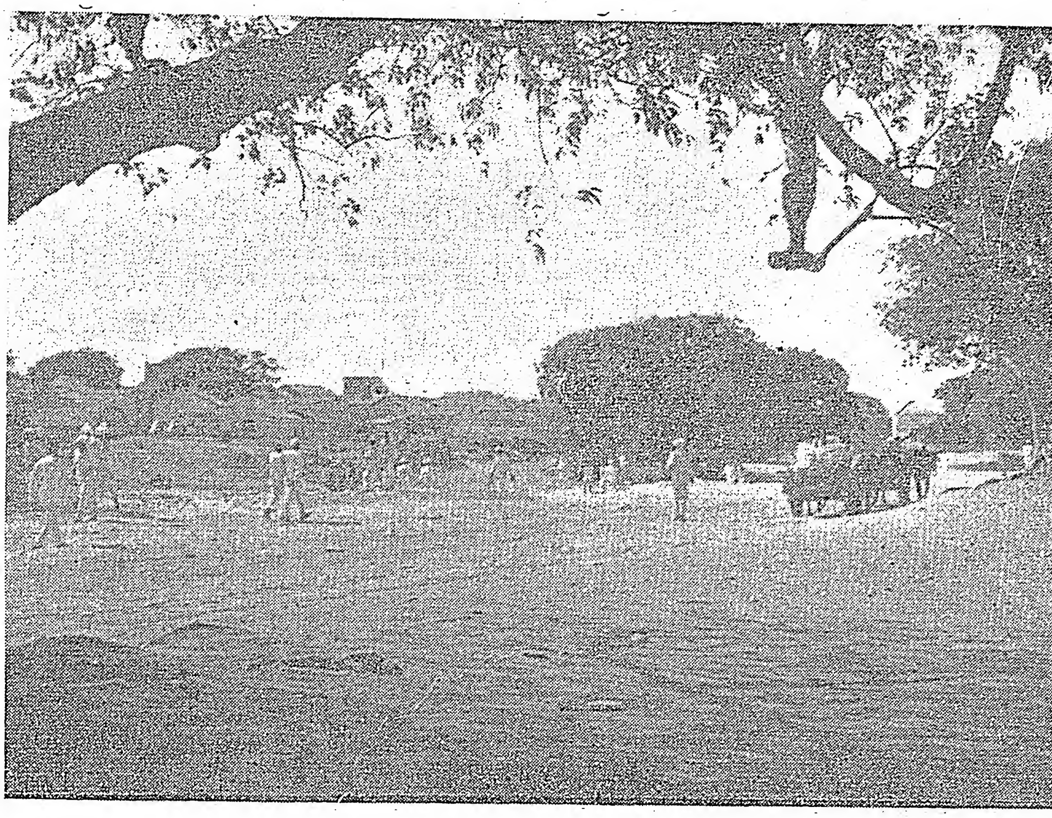
(*Contd. on page 30*)

COMMUNITY PROJEC

More than a thousand representatives from the various villages in the Project Area heralded the beginning of Community Project work

A typical village of the Project Area

The women of the Project Area evinced keen interest in the proceedings



TS IN SAURASHTRA

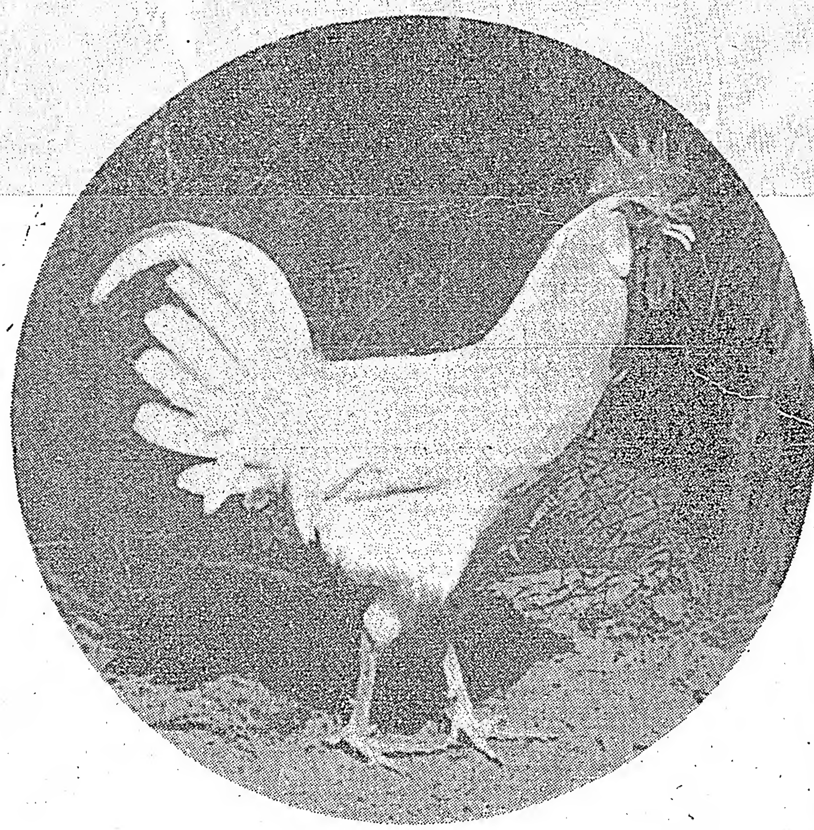
THE selection of Manavadar-Vanthali area in the Sorath district of Saurashtra as a centre for Community Project Development work is appropriate, since the area covers 106 villages with a population of 1,30,000. Furthermore, with an annual rainfall of 30 inches this area is expected to offer opportunities to agricultural workers and farmers for increasing agricultural production. Development work will be initiated in the field of agriculture, animal husbandry, education, cottage and small scale industries. All this will naturally lead to an alround development of the farmer.

Recently, a Convention attended by State officials and constructive workers was held at Pajod—a typical village in this area. The part to be played by community project plans for increasing production was stressed and the villagers were exhorted to help themselves if they were to improve the economic condition of the villages and realize the goal of self-sufficiency.

If plans work out according to schedule, the next three years should bring about marked improvements. Each village is to be provided with two protected wells for drinking water, and drainage and irrigation facilities. There will be one Agricultural Extension Worker for every two villages. Roads are to be so constructed that no village would be more than 1/2 a mile away from a road. Villages of more than 500 inhabitants will have a primary school and after three years, 60 per cent of the total population are expected to be literate. Recreation centres are also to be opened. And if enthusiasm shown by those attending is any index to greater efforts, the Convention at Pajod should bring about prosperity for the people of Saurashtra. (H. K. S.)

—K. M. SHAH

A group of White Leghorns which are being distributed to villagers for improving desi birds



Leghorn Cock

POULTRY DEVELOPMENT IN MEERUT CIRCLE

By H. K. LALL,
Deputy Director of Animal Husbandry, Meerut.

NOT very long ago, when we used to go to the villager and ask him to keep poultry, because it provided him with a cottage industry which could increase his income, and also provide him with animal protein, the missing component in his diet, the very cool reply used to be "I can keep the poultry all right, but what about the disease which just comes and wipes the flock away. I had a go at it number of times but cannot do it any longer." We had no answer to it, and the propaganda mostly fell flat. Now to the same question we have a ready answer "Well, we have the Ranikhet vaccine for you, which will protect your birds, and there are other vaccines and remedies for other diseases like Fowl Pox, Fowl Cholera, Spirochætosis, which can also be provided now." He still has his doubts but he is convinced for the possibility of disease control when he is told that Ranikhet, which causes maximum mortality, can now be controlled effectively by the use of vaccine evolved at the Indian Veterinary Research Institute and now produced and supplied by our own Biological Products Section at Badshahbagh, Lucknow.

RANIKHET VACCINE

Ranikhet vaccine has thus come to the rescue of the development workers. It has made work easier in carrying out the special development scheme in Uttar Pradesh, under which birds costing Rs. 15 to the Government, are given at Rs. 2 to poultry breeders in develop-

ment block areas, and at Rs. 7/8 in other areas. Such breeders are called Poultry Keepers and Poultry Farmers respectively. The speed of progress may be judged from the fact that the number of poultry keepers increased, in Meerut Circle alone, from 112 in 1948 to 333 in 1949 and 684 in 1950, and there was a similar increase in the number of poultry farmers. As against 697 hatching eggs distributed in 1948, 1,500 were distributed in 1949, and about 5,000 in 1950 which was more than 3 times that of the previous year's distributions. Similarly as against 678 birds distributed in 1948, there were 1,300 birds distributed in 1950.

IMPROVED DESI STRAIN

The cause of mortality in field, apart from the disease, are wild animals in the villages. Protection has been provided in some cases by distributing wire netting at extremely cheap rates, but on account of the fact that the birds of improved breeds such as White Leghorn, Rhode Island Reds, Black Minorca and Australorps are generally not so agile and active as the *desi* birds; they become an easy prey to the village cat, dog, hyena, etc. and, therefore, require extra care in their new environments after leaving the farm. It was, therefore, a matter of extreme importance that a breed which could resist these vicissitudes and also have fairly good production, should be evolved. Perhaps partially with this object in view, Poultry Section of Indian Veterinary Research Institute has evolved an improved *desi* strain of poultry, now having production equivalent to that of White Leghorn. Individual birds of that breed have laid as many as 200 eggs while the average birds have laid over 100 eggs of better weight in the first year under village conditions in U.P. in the plains as well as in the hills. This breed need not replace the foreign breed all over, but it is likely to prove a success, when distributed in the villages at a large scale after field trials at other centres. If this is made possible, it will remove the dilemma of the village poultry breeders who want to keep improved birds, and yet have not the means to protect them.

While research comes to the rescue of development workers and breeders by finding out new breeds and new vaccines the development work is also being pushed forward by propaganda through pamphlets and through poultry shows. During the last few years, poultry shows have become extremely popular. During the year 1949 as many as 15 Poultry shows were held in Meerut Circle of U.P., where nearly Rs. 2,000 were distributed in prizes, while in 1950, 21 poultry shows were held and nearly Rs. 2,500 were given away as prizes. This is due to the increasing interest of the poultry keepers. Such shows are also extremely popular in the colonization areas where refugees are ready to take up this industry even though this may promise only a small profit. One such show was held at Hastinapur Centre of Ganga Khadar colonization area where the inhabitants from all over flocked to the show, carrying their birds in baskets, in their armpits, and on their heads.

In this connection Mission Poultry Farms are performing extremely useful function. They are grouped round the main Mission Poultry Farm, Etah, whose Manager Sri A. E. Slater has become a well known figure in poultry circles. The Mission shows are conspicuous for quality of the birds presented there. The work at these farms consists of distributing hatching eggs to breeders in the surrounding villages at cheap rates, and birds from them are purchased at the time of annual shows, which again are re-distributed to the breeders at concessional rates in these very districts, and thus efforts are made to supply the improved poultry to as many people as possible.

ATTRACTED TO POULTRY INDUSTRY

An increasing number of well-to-do people in Meerut Circle are now attracted to the poultry industry on large scale. This is justified, too, because poultry can be one of the very rich industries in the country. We have 115.3 million birds, and the eggs produced are valued at Rs. 72.1 million. Not only that, but the egg provides a protein diet of which there is great deficiency in this country, and is badly required to build up the stamina and resistance against disease. A Chinese, for example, who takes less of milk and cereals, in the opinion of experts who are familiar with that country, has better stamina than an Indian and they attribute it to his consumption of the animal proteins, one of the type of animal protein on which he

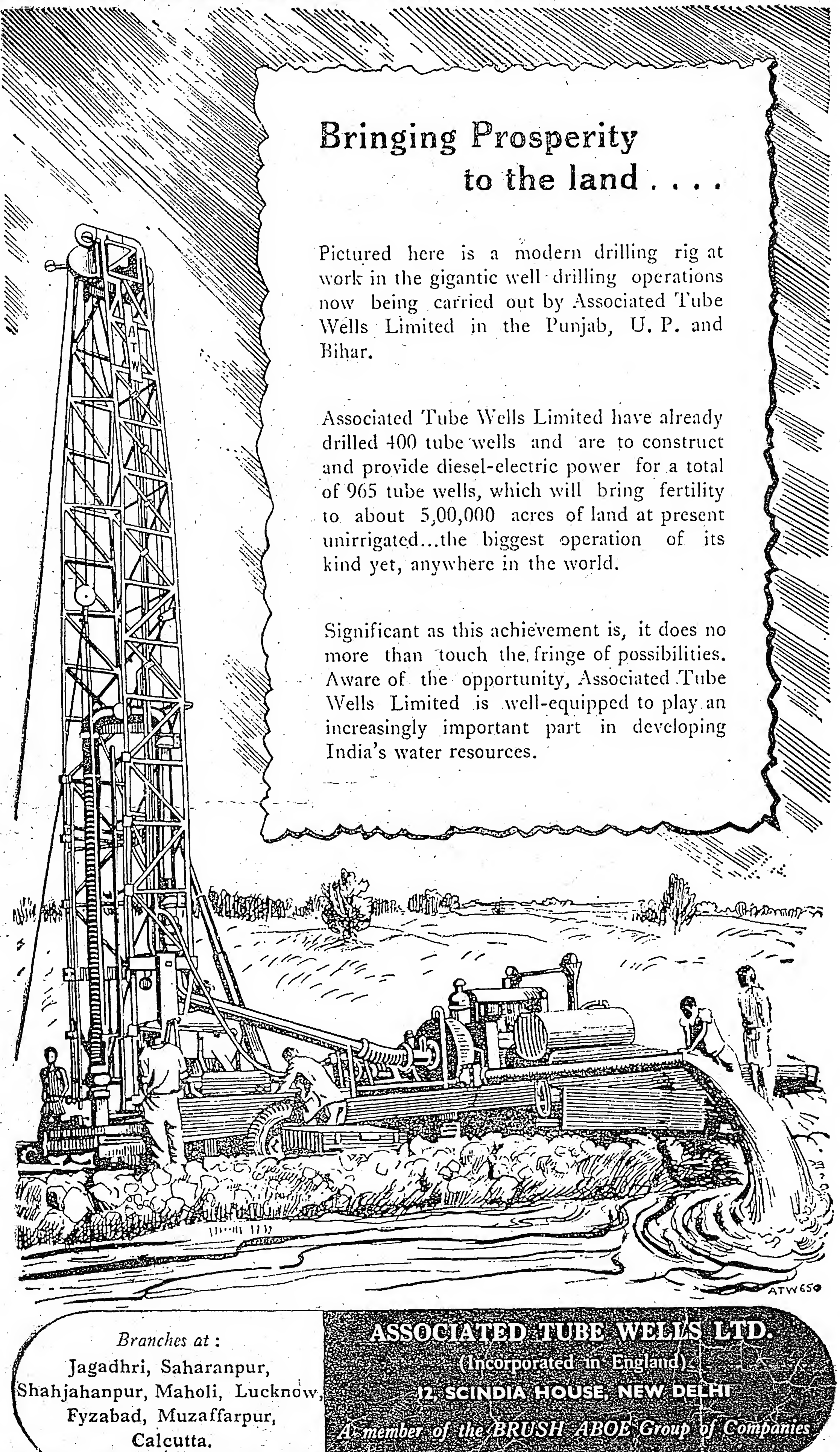
feeds, irrespective of the fact whether he is Buddhist or a non-Buddhist. Many people in this country do not take eggs under the impression that eggs have life in them, not knowing that lifeless eggs can be produced by removing the cock from the flock and the consumption of such eggs need not hurt anybody's sentiments. This, however, is a very difficult task to explain to the layman. The propaganda in this respect of the problem is sure to increase egg consumption, and thereby give impetus to egg production and poultry development.

FEEDING POULTRY

Poultry nutrition is a very important problem in the village where the villager is faced with the difficulty of feeding himself, his children, his livestock and his birds. In view of the shortage of cereals in the country, it has become more difficult for him to spare any cereals, and this is one of the reasons that improved birds deteriorate when they go to the villages. The ordinary *desi* bird, so to say, lives on nothing which, however, is not possible for a bird of an improved variety. This is where research has again come to the rescue of development workers. For instance, it has been investigated that for poultry Bulrush millet (Bajra) is as good as wheat in feeding value and Arhar Chuni (outer husk of red gram) can satisfactorily replace wheat bran and is about one and a half times cheaper. Attempts are being made to substitute cowdung to replace animal proteins, because of its growth promoting factor which helps in the utilization of vegetable proteins. The use of such proteins, as meat entrails and blood from slaughter houses which are normally wasted, can be made use of as poultry feeds with advantage. There is scope for further work of practical nature in this connection. The problem of adequate nutrition is facing the development worker now, but will be more acute in future when the tempo of development work increases, because it is extremely improbable that for the next few years the country will have enough cereals to spare for the poultry.

One of the major bug bears of the poultry consumer and poultry merchant, is to maintain the quality of eggs during summer. The amount of annoyance that one experiences, when one has to face a rotten egg on the table or in the kitchen, is indescribable. Annoyance to the consumer and loss to the producer can be minimized if the methods of preservation of eggs, such as lime pickling, oil preservation, water glass preservation are used more commonly. These processes do not need any elaborate arrangement. Lime pickling simply means dipping the egg in lime solution to block the pores in the shell, so as to stop the air getting into it and thereby saving egg proteins from deterioration. Same principle is evolved when eggs are preserved by dipping them in coconut oil or dipping them in sodium silicate.

To develop poultry activities in the village, it is essential that training should be imparted to men who are carrying out the work. Short courses of 6 weeks, free of any tuition fee, are in vogue at most of the government poultry farms in Uttar Pradesh. Such training is usually given by experienced officers, who have received their training in poultry work after going through specialized poultry courses, which are of different types, to suit all kinds of demands.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FLY BREEDING IN MA
ITS

By **M. A. IDNANI,** Indian Agricultural

ONE of the disturbing aspects of the preparation of farm yard manure and composts is the profuse breeding of flies in manure heaps and pits, for which this medium offers ideal conditions for development. Town refuse and night-soil have in recent years been pressed into service to increase the supplies of manure in India. These urban waste materials are apt to be particularly heavily charged with fly eggs and larvae, resulting in exceedingly large fly breeding in the vicinity of towns, with the added danger of disease organisms being carried and spread by the emerging flies.

No consideration can override the consideration of safety of public health and the question of control of fly breeding becomes of primary importance in the utilization of human and animal excreta and other waste materials for the production of manure. During the organization of work under the All India Town Refuse Compost Scheme of the I. C. A. R. started in 1943, this aspect of the problem evoked serious objection from the health authorities and it became necessary to find ways and means to stop this nuisance effectively in compost pits. It was found that in spite of refuse and night-soil being buried in pits in alternate layers with a 6 inch cover of soil on the top, the emergence of flies was uncontrolled. Observations showed that fly maggots creep up from deeper layers to the surface few inches, where they are transformed into pupae and later emerge out as flies from about the 6th day of filling up of pits. The emergence increases for a few days and is then completed in another 8 days or so. Based on these observations, some simple practical treatments were tried and found to be highly successful in clearing the compost depots of fly nuisance. An account of these is given below, with the hope that it would prove useful to organizers of compost work in urban areas as well as to farmers in the preparation of manure from all types of wastes without the accompanying objection of fly breeding.

1. FIRE TREATMENT OF PITS FOR DESTRUCTION OF FLIES

Compost pits are filled in alternate layers of town refuse and night-soil, with a final layer of soil on the top. Cloth rags obtained from refuse carts coming to the compost depot, are collected and spread, along with some dry refuse, over the pit area, on the 5th day after filling up of pits. This is then set

HINTS TO THE FARMER

(*Contd. from page 23*)

Red rot: This disease limits the growth of varieties susceptible to it. Therefore, cultivation of resistant varieties is the only permanent solution. The precautionary measures consist in sowing of disease-free seed, burning of stubble and diseased canes and growing of cane in long duration rotations.

Smut: It is another common disease which propagates more by planting diseased setts rather than infection by spores. The black whip indicates the disease. Planting of disease-free canes is the chief precaution to check this disease.

Wilt: This disease in certain years occurs in epidemic form. The main causes are cultivation of susceptible varieties, unaerated soil conditions and growing of crop in wilt infested fields. Wilt disappears if these causes are removed.

Top rot: It is a less serious disease. Certain varieties are more susceptible to it than others. Replacement of varieties is the only sure means of checking this disease.

URE PREPARATION AND CONTROL

Research Institute, New Delhi

to smouldering fire, which destroys all pupae lodged in the surface layer of soil. The operation may be repeated on the 10th day to be doubly sure about the destruction of pupae which might have come up after the first fire treatment.

A variety of alternate materials like paddy husk, wheat straw, ground nut husk, dry leaves, saw-dust etc. could be stored in compost depots and used as covers for firing pits in the above manner. The neat layer of dry ash left after firing serves, in addition, to repel flies from fresh contamination.

Manure prepared in heaps could similarly be subjected to fire treatment by spreading a cover of any of the suggested materials and setting this to smouldering fire. While the surface dry refuse may be partly burnt, the material inside the heap is usually too moist to catch fire, which gets automatically extinguished after effectively destroying all the phases of fly life in the surface.

2. FIRE TREATMENT WITH A BLOW TORCH STOVE

Due to the development of heat in manure heaps fly maggots are observed to creep out and the upper layer is found to be teeming with the entire population of maggots concentrated in the surface few inches. This makes it possible to destroy them effectively with the flame of a blow torch stove. Periodical observations of the surface of manure heaps for maggots or pupae enables this treatment to be successfully employed for control of fly breeding. The blow torch stove is particularly useful for firing heaps or pits in the rainy season or where suitable covering materials for firing are not available.

The surface of these treatments enabled the organization of town refuse compost work to be carried ahead and the method was in routine operation at all the centres in Sind, to the satisfaction of the health authorities. Quantitative trials carried out by the Chief Biochemist in charge of the scheme showed that a destruction of 96% of flies could be obtained by the fire treatment.

This practical remedy for an important aspect of manure preparation should provide an impetus for fuller utilization of all farm and habitation wastes and animal and human excreta for production of manure in the country.

LEMONGRASS

(*Contd. from page 18*)

Mr. Willing. "It might save us a lot of money for weeding." "Yes, and furnish manure for more organic matter and income from mutton," I added.

Mr. Willing was born in England and got his college education in Holland. There he met a young lady who later became his wife and whom he affectionately calls "Kelly."

Lemongrass grows wild in many tropical areas. Distillation of the grass was recorded in the Philippine Islands in the 17th Century.

In 1951 the U. S. A. imported 900,130 lb. of lemongrass oil at a cost of $2,810,428.00. India was the main exporter with 476,654 lb. Guatamala, second, with 252,100 lb. Other contributing countries include Haiti, Salvador, Mexico, Belgium Congo, Switzerland, and Brazil.

QUESTIONS AND ANSWERS

Question :—Can phosphatic manures be added while the compost is being prepared actually, and is it that P_2O_5 can thus be fixed in the compost? If so, what is the dose of phosphatic manures to be added during compost making, both in sectional filling and mass compost? (T. N. P.).

ADDITION OF PHOSPHATE TO COMPOST MANURE.

Answer :—Compost manure prepared from town refuse and night soil or sewage sludge contains a balanced proportion of nitrogen, phosphorus and lime, and it is generally unnecessary to add a supplement of phosphate along with the manure to the soil. But manure prepared from cattle and farm wastes is in general poor in phosphorus, due to the diversion of grains and pulses, which are rich in phosphorus, for human food and the general neglect to return human excreta back to the land in the form of compost manure. This has led to a steady lowering of the phosphate level of our cultivated soils, which has not drawn much attention so far, due to the greater poverty of our soils in nitrogen.

In our attempts to make good the nitrogen loss of the soil by application of manure, we should also keep in mind the need to replace phosphate losses, if our lands are not to suffer, at a later stage, from a new problem of phosphatic starvation. The above replacement of phosphorus can best be done by adding to the manure, during its preparation, a phosphate supplement in the form of powdered bones, superphosphate or finely powdered rock phosphate.

The dose of phosphate to be added would, no doubt, depend on the phosphate status of the soil, the intensity of cultivation and the sensitivity of the crops to be grown on the farm to the added phosphate. Legume crops like the pulses, beans, etc., vegetables, fruits, potatoes and, to a lesser extent, cereals and sugarcane respond to additions of phosphate. At high levels of crop yields, the addition of phosphate along with nitrogen becomes quite necessary if the yields are to be maintained from year to year. Since superphosphate is easily 'reverted,' or converted into insoluble forms in the soil, whereas organic forms of phosphate are not so easily 'reverted', it would be advisable, as a normal practice, to pass the whole of the phosphate dose of the farm through the compost-heap before application to the land.

A dose of, say, 10 tons of farm and cattle waste compost would supply about 100 to 150 lb. of nitrogen, but only about 40 to 50 lb. of phosphate (P_2O_5), unless legume fodders rich in phosphate are grown on the farm and fed to the cattle. As such, in order to balance the phosphate deficiency of the manure, it would be useful to add a supplement of 50 to 100 lb. P_2O_5, which would work out to a rate of 5 to 10 lb. P_2O_5 per ton of compost manure added to the land. Since about 100 cu. ft. of freshly packed compost material, either in trenches or in heaps overground yield after 4 to 6 months' decomposition about a ton of ripe manure, the above rate of phosphate addition would correspond to about ½ maund of superphosphate or powdered bones or finely powdered rock phosphate added per 100 cu. ft. of freshly packed compost manure. The above quantity may be added in portions by dusting the same over successive layers of compost during its preparation.

In cases where cattle sheds are provided with stone-lined flooring and drains for collecting urine, it is a useful practice to spread the superphosphate in a thin layer on the flooring and in the drains, especially in the areas where urine collects. This practice helps conserve the cattle urine by preventing its loss as ammonia into the air and thus adds both extra nitrogen and extra phosphate to the manure.

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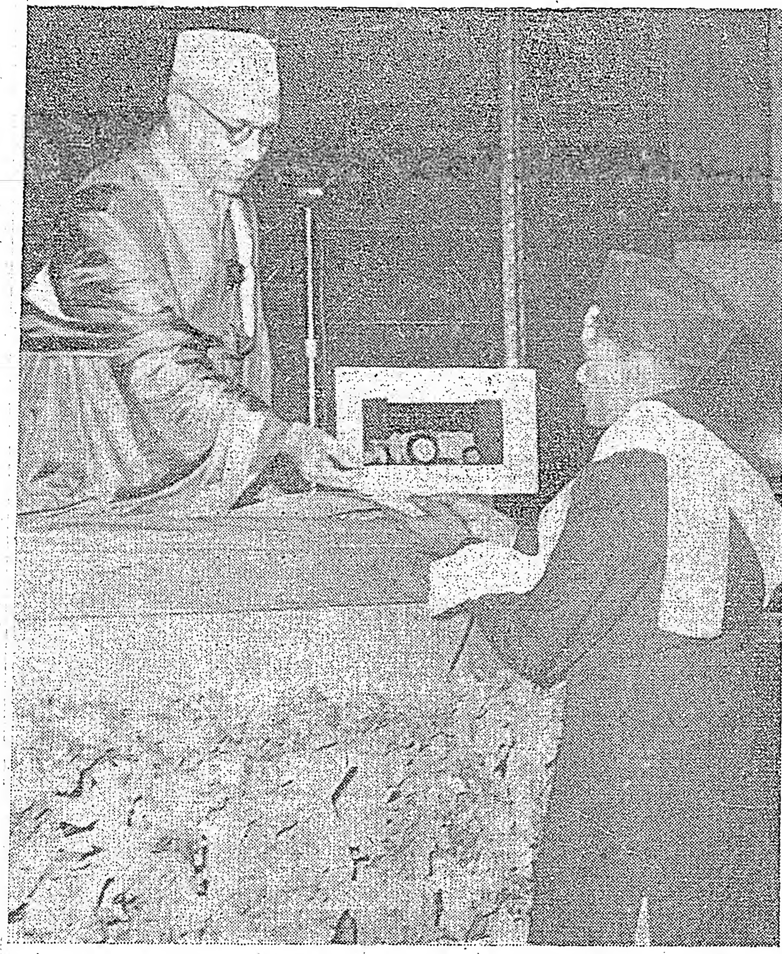
OUR COVER

Research work goes on in the laboratory of the Central Potato Research Institute Patna. After experimenting with over 2,000 world varieties, the Institute has been able to find three varieties resistant to charcoal rot, a common disease of the potato. India is the first country in the world to discover a resistant variety.

EDITOR'S PAGE and EDITORIAL NOTES



Shri Jai Pal Chandra of Uttar Pradesh receiving prize from the Prime Minister for the maximum output of paddy in all India crop competition for the year 1951-52

Addressing the joint convocation of the Indian Council of Agricultural Research and allied institutions recently in New Delhi, the Prime Minister preached the gospel of the dirty hands by exhorting the students receiving diplomas to shed the ghost of aloofness which our rural workers have maintained in the past. No doubt the approach and attitude are changing but the pace is very slow and the reminder is timely. Shri Nehru's words are worth being repeated in the columns of the *Indian Farming* at a time when the country is engaged on a tremendous programme of rural development. He said: "I advise the students who have just received their diplomas not to imitate the 'official mentality' of merely giving orders from the officer's chair and making their official weight felt all round in a spirit of bossiness.

"This is an old habit in India which has no place now in the changed circumstances of today.

"You have to go out to the peasants, who work in the fields and understand their problems. You have to talk to them in their own language, live with them and learn from them. The peasants have centuries-old experience in agriculture and it may be that in certain respects they know more than you do. You as experts should learn something from the peasants before you begin teaching them, otherwise what you say will not cut much ice with the peasants".

CROP COMPETITIONS

Readers of *Indian Farming* would remember "Man of the Month" stories of Jaipal Chandra and Sardar Gurdev Singh. Both these farmers joined the distinguished gallery of "Farmers of the Year" when they, along with four other farmers received certificates of "Krishi Pandit" and an award as champion farmers, in the Crop Competitions conducted by the Indian Council of Agricultural Research.

That Crop Competitions are gaining in popularity from year to year cannot be gainsaid. However a little more effort is required to encourage more and more cultivators to participate in this nation-wide effort to increase food production. Whereas in 1950-51 83,833 competitors took part with some 47,327 acres, in the current year 190,930 farmers entered 102,283 acres representing some 15 States. It is to be hoped that all the States in India will come in for the next competition.

The Central Minister for Agriculture, Dr. Panjabrao Deshmukh gave added importance to the competitions by announcing that the ICAR proposed to institute, in addition to the existing all-India prizes awarded to individuals, national community prizes to be awarded to the best village, tehsil, district and state judged according to certain standards. These prizes will be utilized for the benefit of the participating units as a whole.

This is a welcome announcement and as the Prime Minister observed units participating stand to benefit as a whole by fostering a spirit of healthy competition and co-operation. In this country we have always held that the farmer is a rugged individualist and any co-

operative movement is bound to be slowed down in face of this. However a step like this is likely to produce two-fold results. In addition to giving impetus to "grow more food" drive it will encourage villages as a whole to work together to try to show better results than the neighbouring village and at the same time the collective efforts of the villages in a tehsil will be directed towards making their tehsil the best in the district and so on. If this spirit is properly cultivated and crop competitions are popularised through a sustained campaign aimed at breaking down any psychological apathy towards the competitions and co-operative movement there is no reason why the efforts of all concerned should not succeed in changing the map of the food front and the village life.

KRISHI PANDITS

Recipients of the certificates of "Krishi Pandit" have been hailed as heroes of the Land Army. This is very apt. Toiling in mud and water, under scorching sun or heavy rains, in cold weather or hot these sons of the Indian soil battle against heavy odds and have always gone unpraised, unsung. They are now coming into their own and are equally to be respected as a soldier on a battle front. This year's Krishi Pandits were a colourful lot and their achievements make interesting reading. Potato farmer Jaipachandra produced 735 mds. and 24 seers as against country's average of 75.42 mds. Sardar Gurudevsingh's wheat yield was 71 mds. 23 seers 10 chataks against 6.76 mds. Indian average. Lambardar Waliati Ram's gram production of 46 mds. 2 seers and 5 chataks compares favourably with average yield of 5.14 mds. per acre. The little state of Coorg, represented by the dwarfish Jangama C. Sangayya raised 136 mds. 5 seers and 14 chataks of paddy by which normal production of 7.66 mds. pales into insignificance. Bombay bags two prizes in Jowar and Bajra. Vaman Marathe was the first in Bajra with an yield as high as 29 mds. 11 seers and 10 chataks smashing the average of 2.69 mds. The Jowar champion is Bhimgonda Dada Patel who obtained 84 mds. 23 seers 5 chataks against 3.91 mds. per acre.

(*Contd. on page 32*)

The Prime Minister is seen here with some of the all India crop competitors who won the prizes...From left to right: Shri Jai Pal Chandra, the Prime Minister, P. S. Deshmukh, Minister of Agriculture, Shri Patel, and S. Gurdev Singh

MAN OF THE MONTH

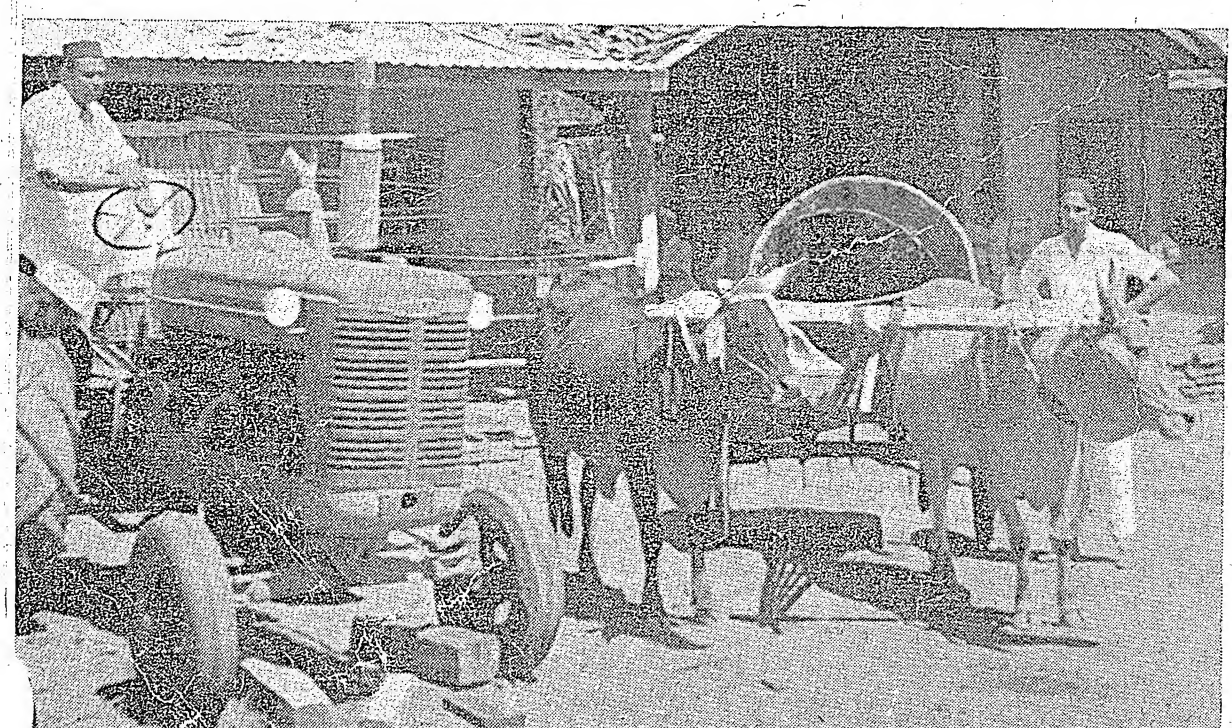
Mechanization is the key note of the GADRE FARM

MADHAORAO GADRE *Mechanization is his faith*

IF you want to know what mechanization of a farm means, you will have to take a trip down Timarni, situated in the Hoshangabad district of Madhya Pradesh, because it was in Timarni that I first met Madhao Rao Gadre, a veteran farmer who has a pioneered mechanical farming in the area. The Gadre farm is a very extensive piece of land, comprising of some 3,100 acres, most of which is under cultivation. It is a mixed farm producing wheat, gram, cotton, linseed and has an orchard in 10 acres, started as an experiment to grow oranges, sweetlemons and guavas.

A HUNDRED YEARS AGO

Originally belonging to Konkan in western India, the Gadre family migrated some 120 years ago and started a small farm at Timarni with 90 acres of land. By 1918, when Madhao Rao took over the farm, it had expanded into some 2,200 acres of land, and today after 34 years of farming, the Gadre holdings have increased to some 3,100 acres.



Tractor and bullocks both have their uses on the Gadre farm

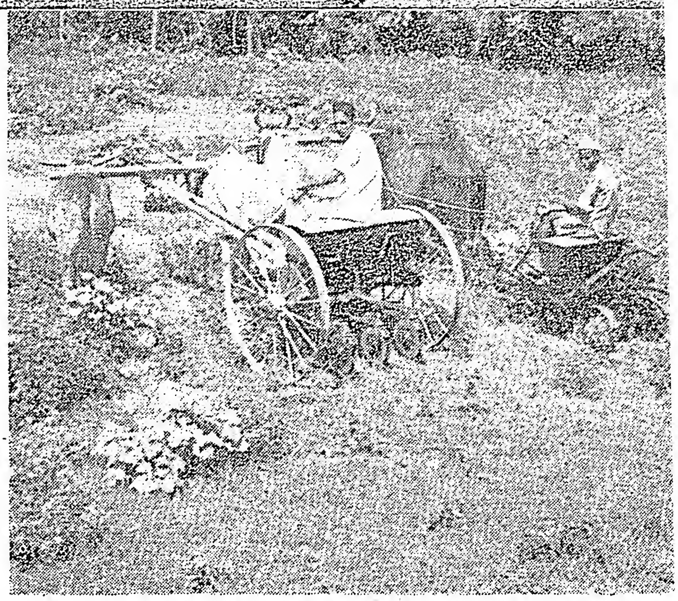
It is not in the last 4-5 years that Madhao Rao has taken up to mechanized farming. When I asked him how he got to be persuaded to buy his first tractor, his reply was typical of the man himself: "My family was growing" he said, "I wanted my yield to grow too. What else was there for me to do but to take to the new ways and new methods." Although, he had more than 2,200 acres of land, vast areas of arable lands had gone out of cultivation due to the growth of obnoxious weed, locally known as 'Kans'. To eradicate Kans, he had to have a tractor and a plough: but that did not serve his purpose, as he found later on, that Kans eradication means a succession of operations in rainy season. No half-hearted measures could ever solve his problem; and this put him on to the idea of complete mechanization of all his farm operations.

However, the outbreak of war and non-availability of the required implements, forced him to drop the idea. This was, more than detrimental to his estate, because more and more land began to get out of cultivation. However, the end of war saw the purchase of one more tractor and other implements, such as, cultivators, narrow plough, offset Harrow and tractor drawn on seed drill machines.

OPERATION 'DEVELOPMENT' STARTS

In the space of three years, from 1948 to 1951, more than thousand acres were brought under the plough, and Madhao Rao became more and more convinced, that only total mechanization of his farm would solve all his problems. And he went in for two more tractors and some other machines, such as, harvester thresher combine, stationary thresher, power mower, and rotary scrapers.

It was way back in 1920-22 that some of the old methods of farming were abandoned and operations like sowing of wheat were conducted through bullock-drawn seed drill machines. Today, at the height of development, the Gadre farm speaks in no uncertain terms of the advantages of mechanization, some of which as enumerated by one of the Gadre boys, who is in charge of all the machines and implements, are



Bullock-drawn seed drills are very useful still

increased yield, recovery of Kans land, solution of labour problem and systematic conduct of the farm.

The reference to the labour problem was a bit intriguing because one argument which everybody puts forth against mechanization is the availability of enough labour. However, it appears that in the area where this farm is situated, there is simply no labour to be had, and for maintaining such a large farm, they had either to take to mechanization, or let some more of the cultivated land go waste. This still does not mean that Madhao Rao could introduce tractors without opposition from the neighbouring farmers, as well as whatever scanty labour that was available in the district. He, however, proceeded with mechanization but this had no effect on the other farmers till 1950. From 1924-1950, is quite a long period for people to make up their minds, but once they did it, tractor buying has become a fashion, in that whereas prior to 1950 only one or two tractors were to be found in that particular sub-division where the Gadre farm is situated, today there are 32 tractors and other miscellaneous

The Gadre triumvirate

Developing the orchard

farm machinery. All this has come up in the space of two years, from the year 1950-52.

INCREASED PRODUCTION

This area is dependent more on the rains and the vagaries of nature dictate the production. While in 1947, the production of wheat was 640 lb. per acre, in 1950-51 it was raised to 800 lb. only to drop down to 400 lb. in 1951-52 because of the untimely rains. Thus, being a dry tract, not only is the irrigation a major problem but drinking water also raises quite a difficulty. Gadre feels that there is full scope for increasing production if some irrigation schemes were taken up. He is also worried about repairs to his machinery, because although the district has tractors purchased from a number of companies there are neither repair workshops nor spares available at short notice. Though production on his own farm as well as other farms in the area has been steadily increasing, all the efforts put in have been hampered by non-availability of enough fertilizers, improved seeds and water as mentioned before. Coupled with this, Madhao Rao would like to see good marketing and transport facilities, adequate communications, more work on soil conservation to turn this into an ideal district.

THE FARM AND THE FAMILY

It certainly cannot be an easy job to run such a farm but Gadre's is a joint family and all the members of the family are working in some capacity or the other in the farm. The area under wheat cultivation is 1,550 acres. The area under rotational crops, such as cotton, gram, linseed, sunhemp, etc., is 450 acres. The area under orchards and vegetable gardening takes about 50 acres. Of the remaining 1,050 acres, he is planning to bring about 300 more acres under the plough this year. About 550 acres have been kept for the farm cattle and the home dairy, and nearly 200 acres tract is useless. Sixty-eight years old Madhao Rao is the head of the family and has two brothers aged 65 and 58. The youngest brother, Gangadhar is in charge of farm machinery; and Sadashiv Rao looks after general farm operations. Sons of all the three brothers are on the farm, one looking after maintenance, yet another maintaining liaison with the outside world and the rest of them looking after certain blocks of the farm. Farmers in this dry farming tract generally pay more attention to monsoon cultivation and preparation of good seed bed, thereby increasing maximum water holding capacity of the land. They also look to the conservation of the moisture in the soil, thus turning cultivation in this tract into a fine art. One of the main features of the Gadre farm is their activity on the soil and water conservation front. These twin problems are major problems confronting the farmers all over the country, and the orderly manner in which the Gadres are tackling this problem, lends hope for a better future.

Although, by the standards of crop competition and other 'grow more food' schemes, there is nothing striking to be said about the yield on the Gadre farm. What entitles him to a place in the distinguished gallery of the 'Indian Farming' men of the month, is the pioneer work in mechanization done over a period of some 25 years. He and his brothers have pinned their faith on mechanization and they are getting dividends too. Although Gadres may have been Malguzars and landlords, this farm is their own now and has been paid for by them, and is being directly cultivated by the family. I found them quite a bit apprehensive about the future of their stay, because of some contemplated Government action, but it appears that they are continuing to do a good job of work and the farm fully deserves to be treated as a demonstration centre to which the

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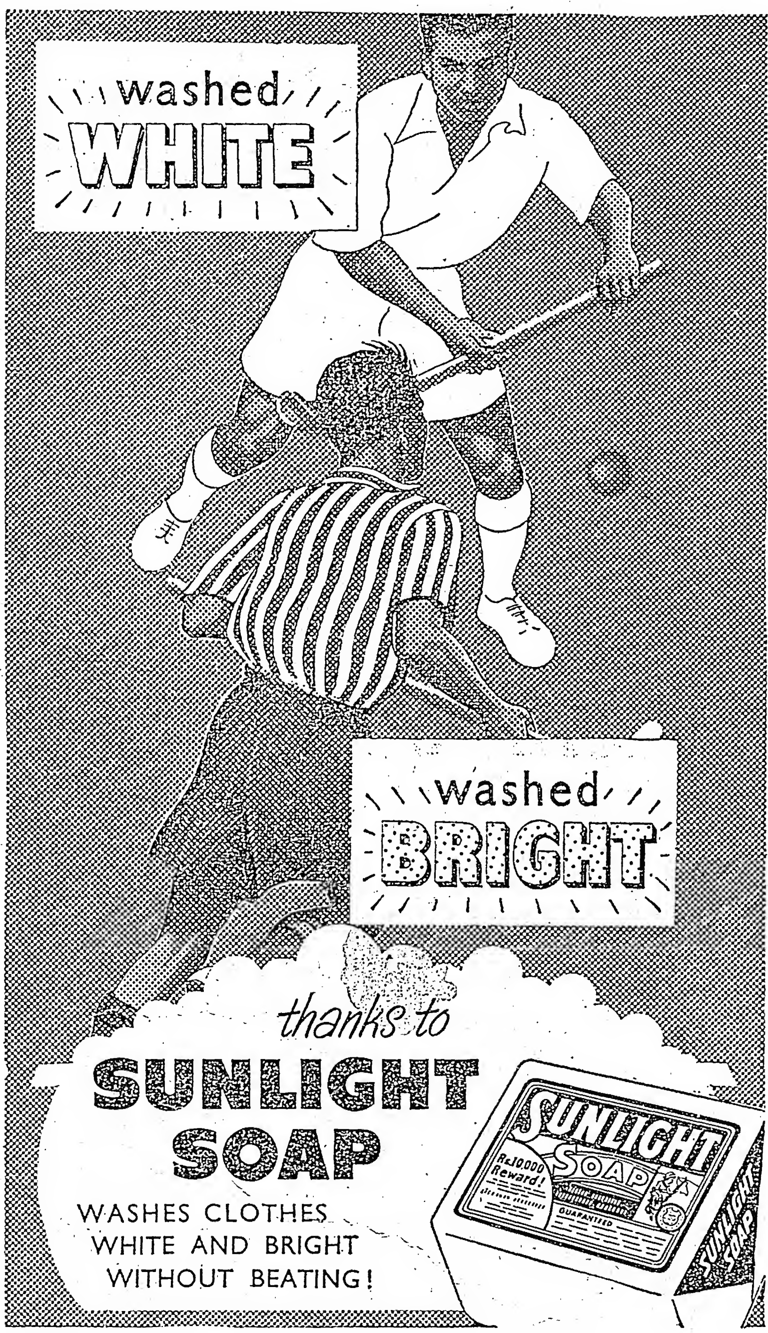
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Hints to the farmer.

KHARIF

White gourd weighing 60 lb. grown at the Central College of Agriculture Farm, I.A.R.I., New Delhi

By **JASWANT SINGH** and **ROMESH CHANDRA**
Central College of Agriculture, I. A. R. I., New Delhi

THE growing of vegetables is both an art and a science. A well planned and scientifically laid out vegetable garden is of fundamental importance in regard to efficiency in the production of vegetables. It helps in reducing the cost of production and increasing the yield. In the vegetable growing areas the intensity of cropping is very high and a large amount of labour is required for sowing, hoeing, harvesting and other cultural operations. The importance of vegetables lies mainly in the fact that they are the chief source of vitamins and help in providing balanced diet. Deficiency of vitamins in diet causes certain diseases. Besides the farmers and professional vegetable growers other people can also grow vegetables to meet the needs of their families. This article gives useful tips on how to grow Kharif vegetables. The main Kharif season extends from the beginning of May to the middle of October, but the Zaid Kharif season starts from the beginning of February. The following important Kharif vegetables have been briefly discussed in this article:

Gourds: Bottle gourd, red pumpkin, pumpkin or white gourd, squash gourd or vegetable marrow, bitter gourd, sponge gourd, snake gourd, *chapan kadu*.

Fruit bearing crops: Lady's finger, brinjal, cucumber, long melon, melon, squash melon, water melon.

Root crops: Arum, sweet potato.

Aromatic and flavouring crops: Chillies, turmeric, ginger, and spearmint.

LOCATION AND LAYOUT

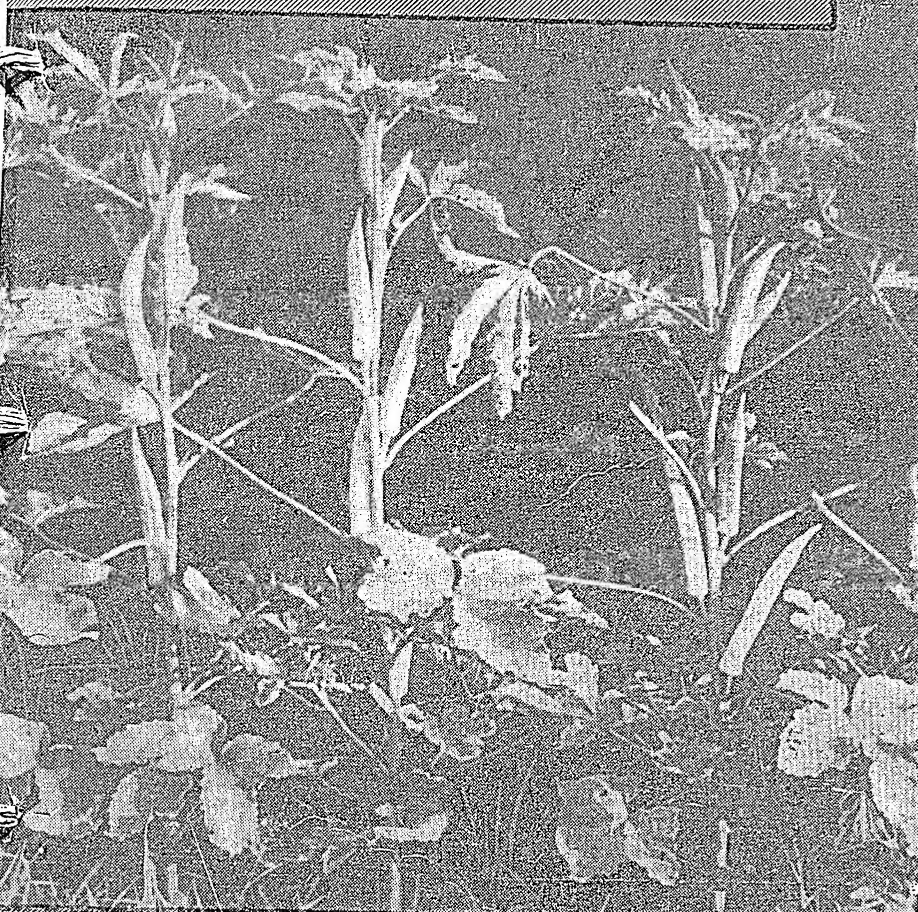
Before starting vegetable gardening a well-drained land free from shade should be selected as near the source of water supply as possible. Vegetable crops require protection from animals and unfavourable weather conditions. Generally one-sixteenth of an acre plot will be sufficient to meet the requirements of an average farmer's family for the whole year. Actual area under vegetable gardening depends upon the quality of soil, supply of labour, manure and water. For vegetable growing for the market, manageable field size may be taken as an acre with sides 220×198 ft.

Layout: Individual fields should preferably be laid out in rectangular shapes for convenience in performing cultural operations. The whole field may be divided into two portions by a path or a ridge in the middle, making the beds of convenient sizes for irrigation purposes. The water channel may run on either side of the path or in the middle of the field. Before making the sub-plots the land should be thoroughly tilled in order to get a very high degree of tilth.

CLIMATE AND SOIL

Kharif crops are fairly tolerant of high temperature provided it is

Vegetables



Lady's finger (Sabour selection) grown at the I.A.R.I., New Delhi

not accompanied by lack of soil moisture. A good loam soil with high organic matter content is the most suitable for raising vegetable crops. Other types of soils can also be improved by manuring and proper tillage. Summer vegetables will not tolerate acidic, wet, or badly aerated soils, and such soils should not be selected for vegetable growing.

CULTIVATION

The plots should be tilled well, as most of the vegetable crops are surface feeders and develop an extensive root system. It is very essential to cultivate thoroughly the top six inches to one foot of soil. Without proper tilth full benefit of fertilizer use cannot be derived.

MANURING

Addition of farmyard manure or compost is considered to be the best for vegetable gardening. It should be applied at least one month before the crop is sown. Thirty to forty cartloads of farmyard manure per acre for the whole year will be enough. In fields which are to be put under vegetables, vegetable growers are known to apply even 80 to 100 cartloads of city sweepings. The alternate method would be the ploughing in of a green manuring crop like Guar or sunnhemp in the previous summer or *khesari* (Materi) during the preceding Rabi season. But, green manuring will mean that it will not be possible to grow vegetable crops during the period when the land is occupied by the green-manuring crops and about two months subsequent to this. This is because some time must be allowed for the organic matter buried in the soil to decay. And, since the vegetable crops as a rule are more valuable for monetary considerations, the commercial vegetable growers prefer application of city sweepings to green manuring. In case city sweepings are not available and there is scarcity of manure, green manuring with some leguminous crops mentioned above can be done.

VEGETABLE SEEDS

On good quality seed depends the successful and profitable growing of vegetables. Seed of good variety should be obtained from a reliable person or firm, otherwise, spending of money and effort will not be properly rewarded. It is advisable for the farmer or the vegetable grower to grow early or late vegetables in order to get supplies over long periods and also to get the maximum return from his vegetable garden. Vegetables produced very early in the season and put on the market usually fetch very high prices. As good quality and reliable seed is not always easy to obtain, the farmer should select his own seed. The following few points should be borne in mind for selection of good seed:

1. Mark out plants showing good vigour and correct type of growth.
2. Observe the blooms and the adaptability of the plants to set fruits.
3. The shape of fruit should be uniform with uniform ripening qualities.
4. Select fully ripe fruits and allow them to mature for seed.

SOWING

Sowing of Kharif vegetables starts from February and lasts upto July. Mostly the crops are sown directly on ridges with distance between two ridges varying from 10 to 12 ft. in the case of gourds and pumpkin and 2½ to 3 ft. in the case of lady's finger and brinjal. Care should be taken to make ridges of uniform height so that irrigation water may spread evenly. The distance in crop rows varies with the vegetable crop sown. Generally, the seed is dibbled

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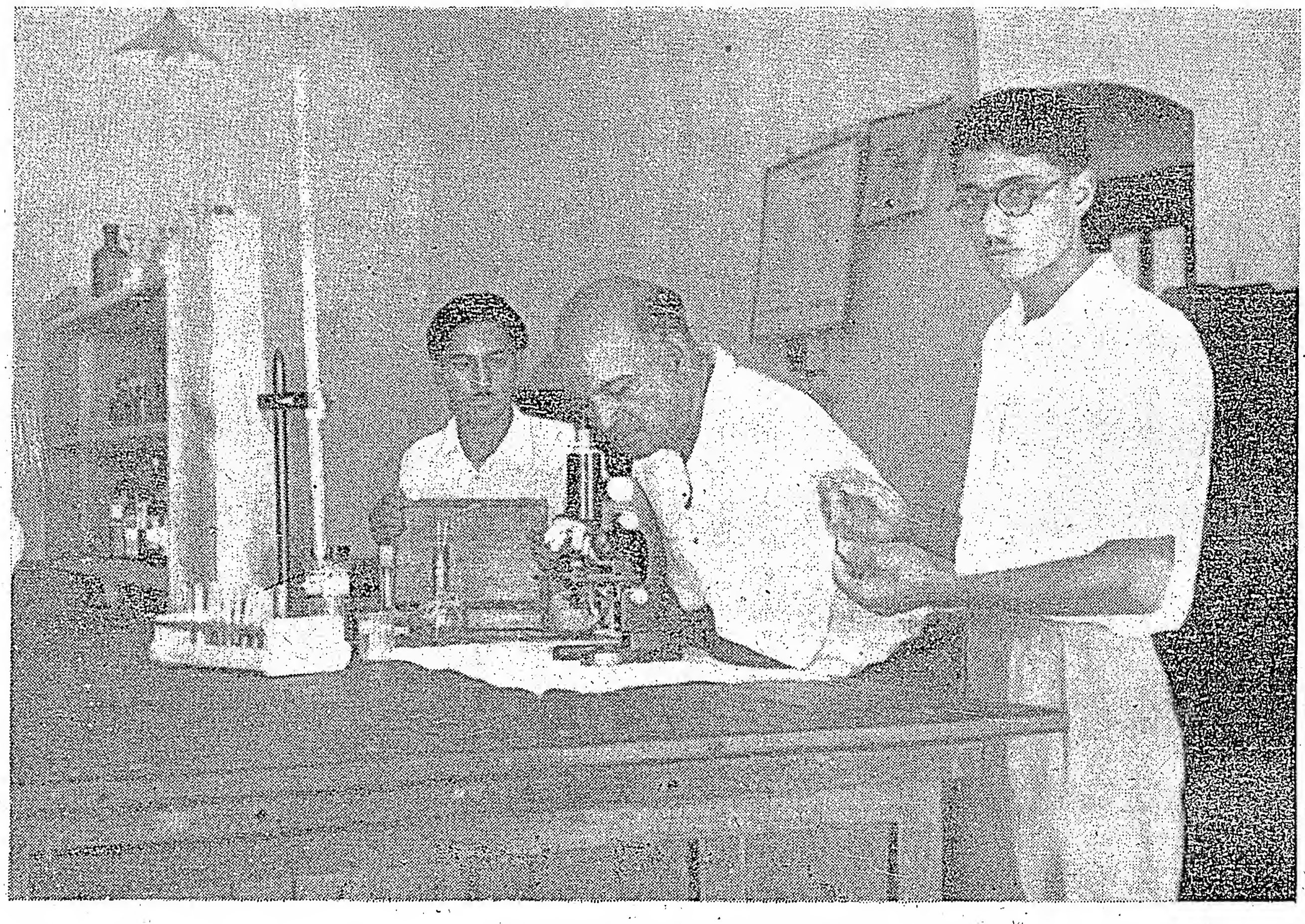
ARTIFICIAL INSEMINATIONS AT KARNAL



Examining semen for quality

By **J. D. SAMPATH KUMARAN,** Government of India Cattle Farm, Karnal

FOR the speedy improvement of our livestock, the present-day biological inventions such as artificial insemination can be profitably made use of. Myth and taboo should no longer be allowed to eclipse sex and reproduction; their role as expressions of physico-chemical forces should be examined and explained to the villager. With greater transport facilities to hold demonstrations in the villages, the zootechny of artificial insemination can be popularised among the rural folk with advantage.

Under the auspices of the Indian Council of Agricultural Research, a key farm centre was started in December, 1951 at the Government of India Cattle Farm, Karnal, with the purpose of improving the cattle and buffaloes of Karnal and its neighbouring villages through artificial insemination. It was also intended to carry out a livestock survey of the area. During the past ten months, more than two thousand artificial inseminations have been done in this area and the first 'test-tube calf' was born on the 14th September, 1952. Subsequently, many more have been born and a continuous crop is expected to follow from now onwards.

Under the Scheme, a well equipped laboratory has been established in the dairy buildings. An inspector and six stockmen, all trained in this centre, have been appointed. Three Hariana bulls and three Murrah buffalo-bulls are maintained for the supply of semen.

COLLECTION OF SEMEN

Semen is collected with the aid of a cow or she-buffalo in 'heat' and by using artificial vagina. The following observations are then made ;

(1) Density of the semen in the collection tube on visual inspection.

(2) Evidence of swirling motion under the microscope.

(3) Microscopic estimate of the percentage of spermatozoa showing progressive forward motion (50 per cent or higher).

(4) Time required for semen to reduce methylene blue (in 10 minutes or less). This method appears to

First test-tube calf of Karnal

give the best indication of the fertilizing quality of semen, and at the same time, is sufficiently inexpensive and quick for field work. It is based on the dehydrogenization power of sperm cells, using methylene blue as an indicator in the so-called "Redox system". The quicker the methylene blue is discoloured by a certain standard amount of semen, the greater is its content of active sperm cells.

(5) Other physical and chemical characteristics for the evaluation of semen such as pH, viability in storage, percentage of abnormal sperms, percentage of live and dead sperms and resistance to various shock treatments, are also tested.

USE OF DILUTER

The phenomenal expansion of artificial insemination has necessitated the development of various means of vastly increasing the number of females that can be bred to a single sire. This can be possible only when a single ejaculate is divided into many smaller parts and used for a greater number of females. The practical difficulty involved in utilizing microscopic volume of semen has resolved the problem to the adoption of dilution of semen with appropriate media. Incomplete as the present knowledge about the life of the spermatozoa in vitrio is, any kind of final conclusion regarding the most suitable diluter is not likely to be drawn for some time to come. The egg yolk buffer diluter with phosphate or citrate is quite popular in the U.S.A. European workers are mostly using a glucose phosphate-gelatine preparation. Various diluents have been used in this laboratory and the one which is giving very good results is described somewhere in this article.

Recent research has shown that fertility increased when certain antibiotics were added to the diluted semen. Therefore, all diluted semens were given the advantage of an added antibiotic. The choice of the antibiotic was a sulfa drug. It appeared that sulfamethazine (sulphadimidine sodium 16 per cent w/v) was suitable for increasing the feritility of diluted bull and buffalo-bull semens.

The ratio of semen to the diluter in our study ranged between 1 : 10 and 1 : 20. The ratio of egg yolk to the mixture of buffer and glucose solution was 1 : 5. The different ingredients were dissolved separately in distilled water.

The following two mixtures could be prepared and kept as stock solutions ready for use whenever required.

Mixture "A": Sodiumbicarbonate 1.3 per cent solution.

Mixture "B": Glucose 5 per cent solution, add sulfamethazine (sulphadimidine sodium 16 per cent w/v) at the rate of 2 per cent. This gives a pinkish colour which gets decoloured after a few days.

The above diluent has been very successfully used in our 2000 and odd inseminations. As a routine practice, semen is diluted and preserved in the frigidaire for a period of six days only, although experimental results with diluted semen twice that period, or more, have been satisfactory.

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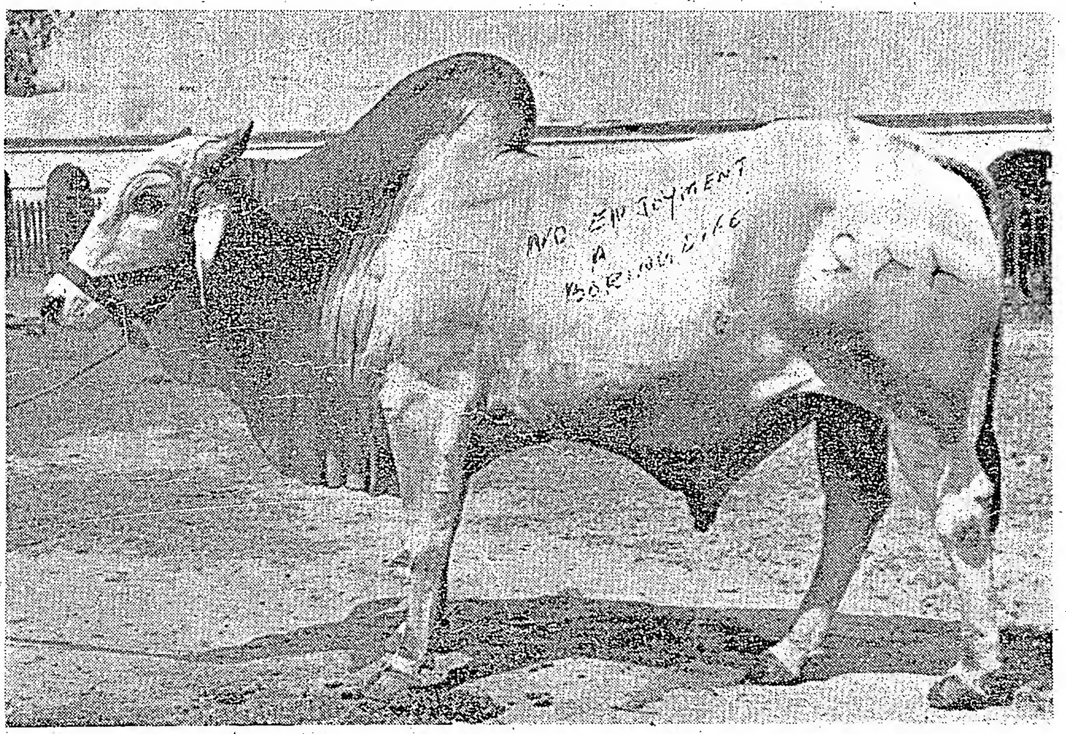
A semen donor



UTILIZATION OF SOME INDIGENOUS SOURCES OF MANURES

By M. A. IDNANI,
Assistant Agricultural Chemist, Indian Agricultural Research Institute, New Delhi

SOILS in India are notorious for their poor crop production capacity. The average yield per acre is perhaps the lowest in the world but it has been amply demonstrated that yields comparable to the highest recorded anywhere, can be obtained with special attention to judicious manuring, among other things. It is recognised that the low level of nitrogen generally found in Indian soils constitutes one of the chief limiting factors which is responsible for the poor growth of crops. The deficiency of this essential element arises from the high temperatures prevailing under the tropical conditions which quickly burn up organic nitrogenous residues in the soil so that it is difficult to obtain the optimum amounts of nitrogen and organic matter necessary for plant growth in our soils. One of the most fruitful methods of increasing crop yields in India therefore lies in the liberal use of nitrogenous manures and fertilizers. It is estimated that the minimum requirement of this type of manures in India is of the order of 2-3 million tons of nitrogen. Of this, some 75,000 tons are imported and about 9,500 tons manufactured in the country. It would therefore be fruitful at this stage to undertake a survey of a large variety of nitrogenous waste materials available in the country which can be put to profitable use as manures and pressed into service for this purpose. An outline of scope in this field is given below:

FARMYARD MANURE

The value of this traditional manure has been examined by many workers and the available evidence indicates that apart from its other beneficial effects on the soil, farmyard manure is in quantity and quality a low grade and slow acting nitrogenous manure. The average nitrogen content in farmyard manures used in India does not exceed 0.5 per cent. The nitrogenous compounds present in a fermented manure of this type are of complex chemical nature and low availability, which may often prove inadequate to meet the requirements of growing crops under Indian conditions. While there is considerable scope for improving the quality of farmyard manure by proper incorporation of the urine fraction and preparation of manure in pits instead of heaps, experimental evidence indicates that a combination of this with fertilizers and manures of higher nitrogen availability would be more useful for Indian soils.

BLOOD MEAL

Blood from slaughter houses is a source of a valuable manure which does not appear to have received the attention that it deserves in this country. On an average about 2 lb. of liquid blood per goat head and 12 lb. per cattle head are obtained. One hundred pounds of liquid blood yield 20-25 lb. of dry blood meal. It is estimated that over 20,000 tons of dry blood meal for manurial purposes could be gathered from this source annually in India. Blood manures contain 8-14 per cent nitrogen which has been found to be 80 per cent as efficient in crop producing power as ammonium sulphate.

Blood can be dried by adding 1-3 parts of lime to 100 parts of liquid blood. This immediately forms a solid cake which readily dries in air without putrefaction.

MEAT MEAL AND TANKAGE

Offal from slaughtered animals and meat that is unfit for human consumption can be useful raw materials for manure preparation. When subjected to steam pressure of 50-60 lb. for a few hours and then dried, the materials can be ground to powder which may contain 9-11 per cent nitrogen. This type of manure goes by the name of 'meat meal'. Whole carcasses of dead animals can be treated in this way, in which case the bones also get included in the manure. The composition of this 'bone tankage' varies from 3-10 per cent nitrogen and 7-20 per cent phosphoric acid. It is considered that a good quantity of this material could be profitably utilized in a large country like India.

LEATHER MEAL

Scrap leather from the manufacture of shoes and leather goods and unserviceable animal hides and old leather articles can be processed with steam or sulphuric acid to yield a nitrogenous manure of value in crop

production. The material can then be ground to a powder which may carry 6-11 per cent nitrogen.

HOOF AND HORN MEAL

Hoof and horn meals are also by-products of slaughter houses and result from the processing, drying and grinding of hoofs and horns. The processed meal is a high grade nitrogen source and may contain 15 per cent or more of nitrogen.

HIDE, HAIR AND WOOL

Hair and wool are obtained as wastes from industries dealing with manufacture of finished articles from these. By processing with steam or sulphuric acid they yield a fine powdery manure containing 8-14 per cent nitrogen.

BAT GUANO

This guano which forms another interesting source of manure comes from the dung, refuse and bodies of bats accumulating in caves and similar hideouts. Little has been done in India to explore deposits of this valuable manure. Bat guano may contain up to 12 per cent nitrogen and 14 per cent phosphoric and should prove an effective manure for Indian soils.

FISH MANURE

Utilization of fish not suited for other purposes as a manure is an old practice in many countries. Dried powdered fish may contain 8-10 per cent nitrogen and 4-15 per cent phosphoric acid. With the long coast-line of the country, there is considerable scope for catching large quantities of inedible fish which can be processed into an excellent organic manure.

HUMAN HAIR

This material available in some quantity from hair cutting saloons in large towns has been utilized with profit as manure in China and Japan. By treatment with steam or sulphuric acid, the material can be reduced to a powder yielding 10-14 per cent nitrogen of high availability. It is estimated that about 17,000 tons of this manure could become available from the male population of the country.

NIGHT SOIL

The value of night soil as a manure of high quality is established by the high level of fertility of lands in China where its utilization has been practised for a long time. While considerations of public health and hygiene do not warrant its use in the raw state, it is possible to reduce the material to a powder by mixing it with materials like soil, ash, charcoal powder, saw-dust, etc. Such 'poudrettes' have been found by experiment to be valuable manures for Indian soils. The amount of this manure that could be made available annually is estimated at 35,00,000 tons, containing 2-3 per cent nitrogen along with various other nutrient elements.

HUMAN URINE

This fraction of the human excreta, known for its high value as a nitrogenous manure has found little application in agriculture so far due to lack of a suitable method for its collection and conservation. This practical difficulty has been overcome in the design of 'Agri-San' urinals evolved in this Institute, which can be put to effective use for this purpose. It is estimated that about 1.5 million tons of nitrogen can thus be made available annually from this source for use as manure.

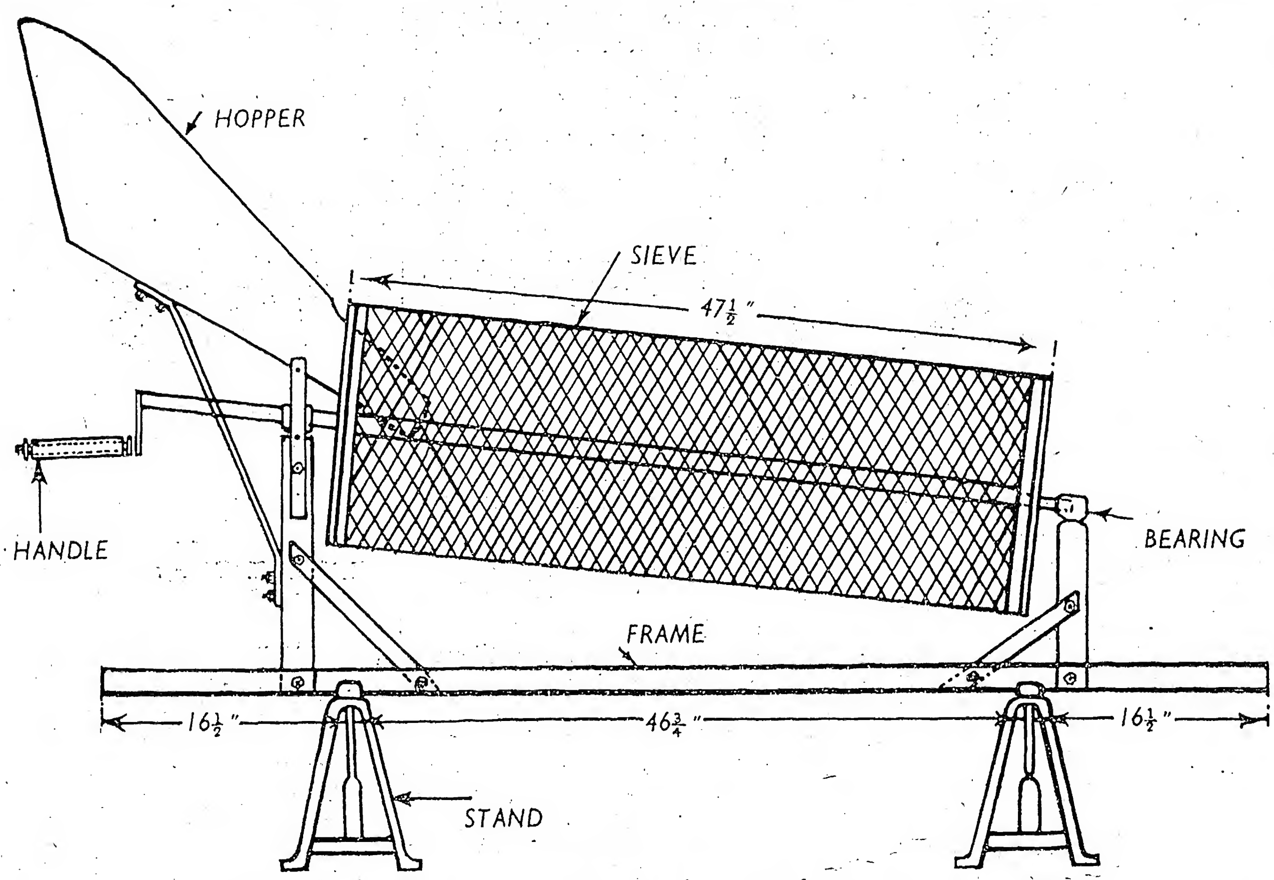
WILD LEGUMINOUS PLANTS

Leaves and seeds of a number of wild leguminous plants analysed in this laboratory, have been found to contain 3-6 per cent nitrogen, in addition to substantial quantities of phosphorus, potash, lime and other elements and in actual crop growing tests proved highly useful for increasing yields. It would be possible to collect these materials in substantial quantities particularly from forests and transported where required after drying.

This brief outline of the scope for the utilization of a variety of materials available in the country, does not cover the whole field of such unconventional sources of manures which could be exploited with profit and is intended to stimulate interest in this direction. The need for undertaking a fuller survey, is in the first instance indicated, to explore these and other sources of such materials which could go a long way in meeting the requirements of the country.

NEW SIEVE FOR SCREENING TOWN REFUSE COMPOST MANURE

By **D. N. KHERDEKAR,** Mechanical Engineer (Extension),
Division of Agricultural Engineering, Indian Agricultural Research Institute, New Delhi



COMPOST SIEVE

SCALE :— $\frac{1}{6}$" FULL SIZE

FARMERS all over India have now begun to understand the importance of compost manure; this is apparent from the ever increasing demand for the compost manure from the farmers. Under the 'grow more food' campaign, numerous compost schemes were introduced by the various State governments. For this purpose, compost depots were established in big cities and towns, where compost was prepared and sold to the farmers. The compost, if properly and substantially used, can, to some extent, solve the problem of addition of organic matter to the Indian soils.

The compost manure prepared in the villages and on private farms consists of nearly 95-98 per cent organic matter in the shape of grass, Karbi, legumes, straw, leaves, etc. But, when the compost is prepared from what is known as refuse from cities and big towns, it usually contains 20-25 per cent of foreign inorganic matter consisting of pieces of bricks, stones, tiles, glass, china, steel, etc., this has no manurial value and the farmers naturally feel that they are not being given compost manure worth their money. Also, when the unscreened compost is spread in the fields, it usually results in causing

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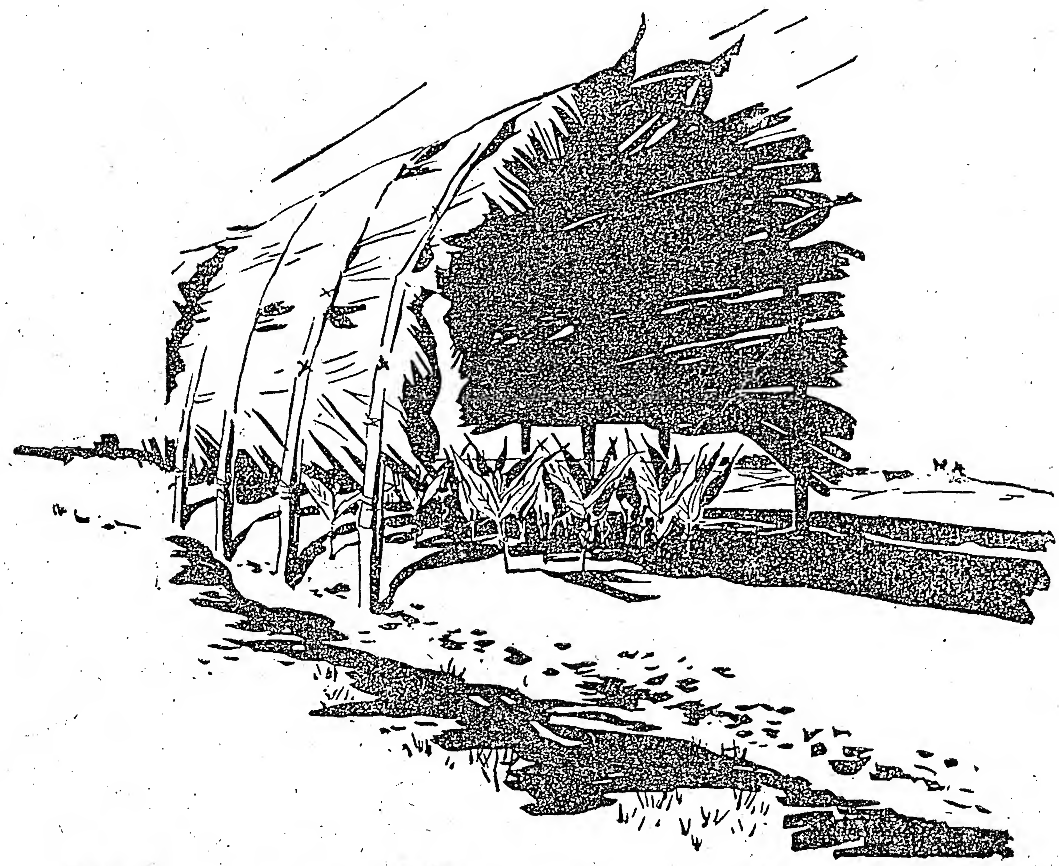


LUCKNOW INFORMATI

in RETROSPECT

By HA

As in the field of agricultural research so in the matter of disseminating agricultural information, it was but natural, that the I. C. A. R. should have given a lead to the country. Many a far reaching decision was taken at the All-India Agricultural Information Conferenec held at Lucknow from 17 to 19 November, 1952. The event, first of its kind in India, was sponsored by the I. C. A. R. The important feature of this Conference was that it brought together all those, who are interested in ameliorating the farmer's lot, on one common platform. Over 150 delegates representing agricultural, planning and health departments of the various States, the trade and industry connected with agriculture, Ford Foundation, the T. C. A. and the officers of the I. C. A. R. cooperated in planning an agricultural information machinery.

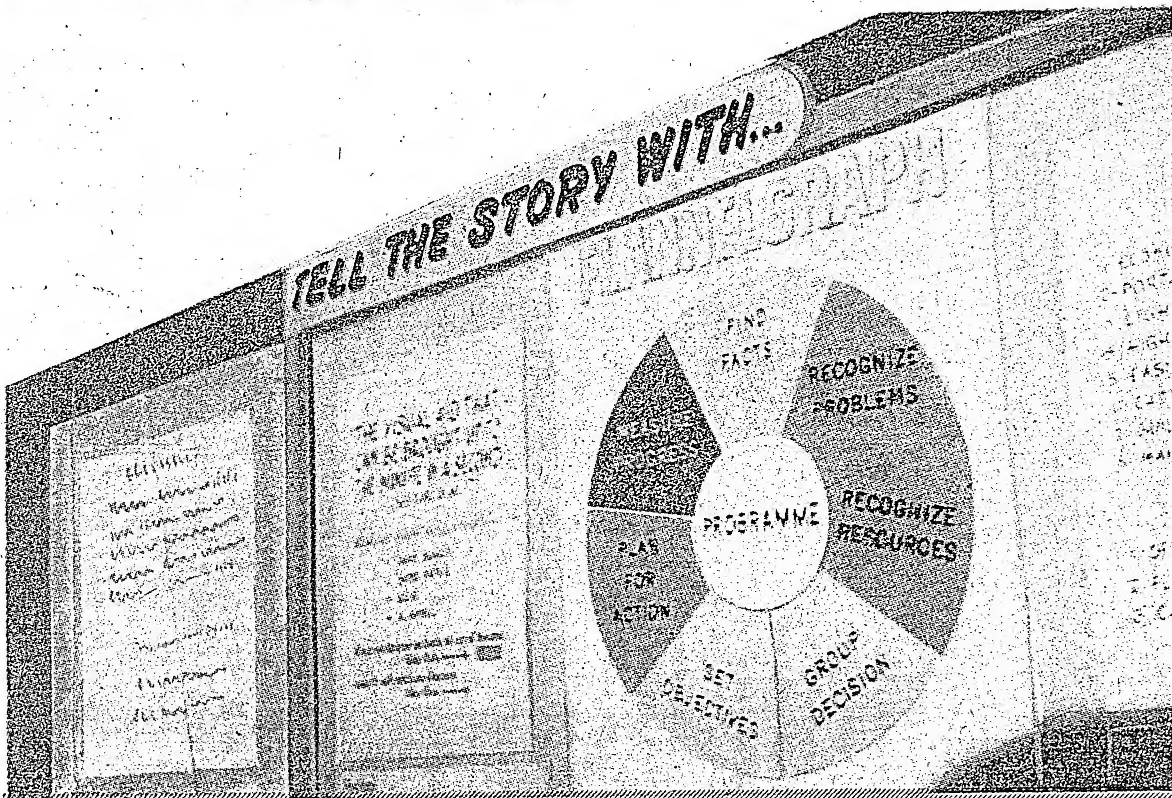
The significance of such a step in India could not be greater at any other time. Inspite of the fact that agricultural pursuits are the mainstay of India's economy, agriculture is its weakest sector. The farmer still clings to the old and antiquated methods of farming. This has been the main reason for our low farm production level.

The distressing aspect of the agricultural research in this country is, that while technical information is available to those already initiated in scientific agriculture, it does not filter down to the primary producer to whom it will be of immense benefit. Results of research, valuable in stepping up food production, are often found in private files of research workers or pigeon-holed in research institutions. Useful results of research, unless they can be utilized to improve production, are hardly of any consequence.

A healthy sign noticeable in all the discussions held at the Conference was the visible mood of introspection and awareness of this fact. Almost all the speakers unanimously subscribed to the view that there was an imperative need for setting up a well-knit agricultural information organization in order to provide a channel for supplying to the farmer latest and most useful information. The problem before the Conference could be enunciated thus—how to

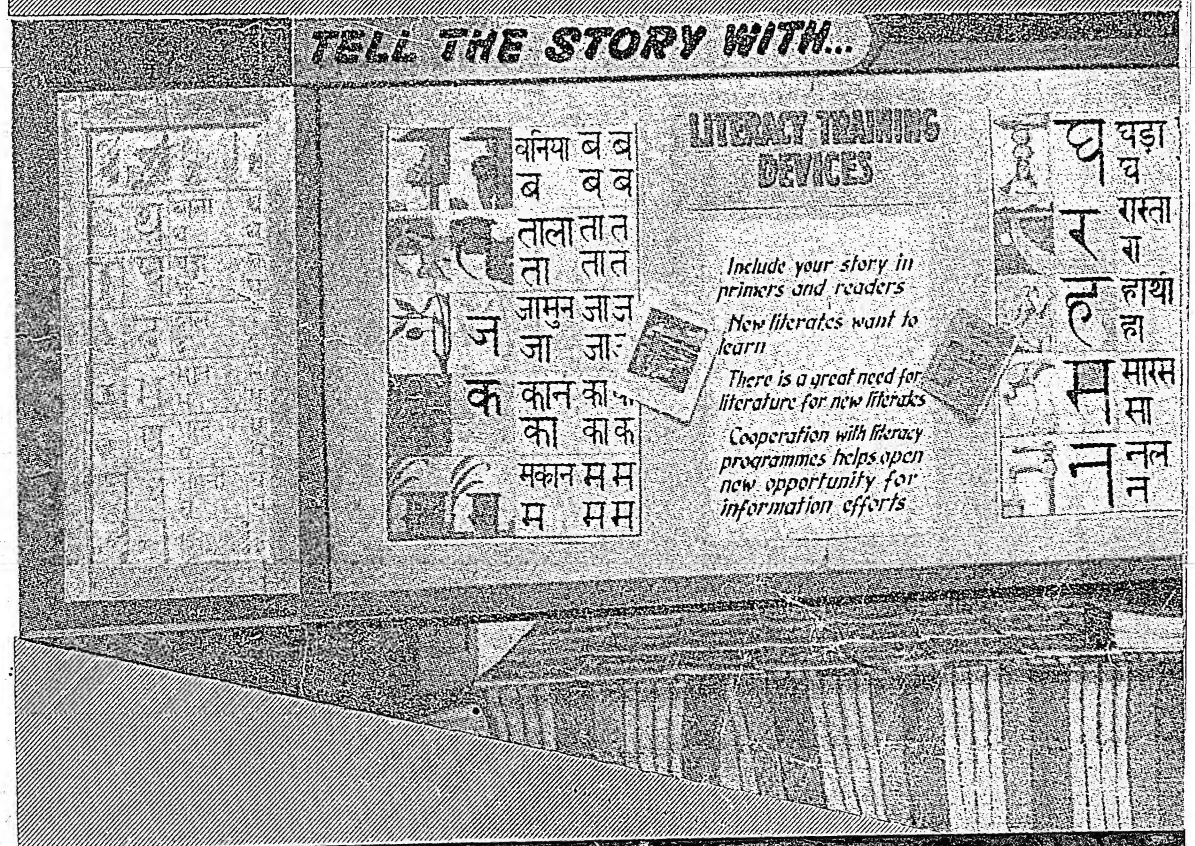
N CONFERENCE

The delegates were greatly interested in the proceedings of the conference

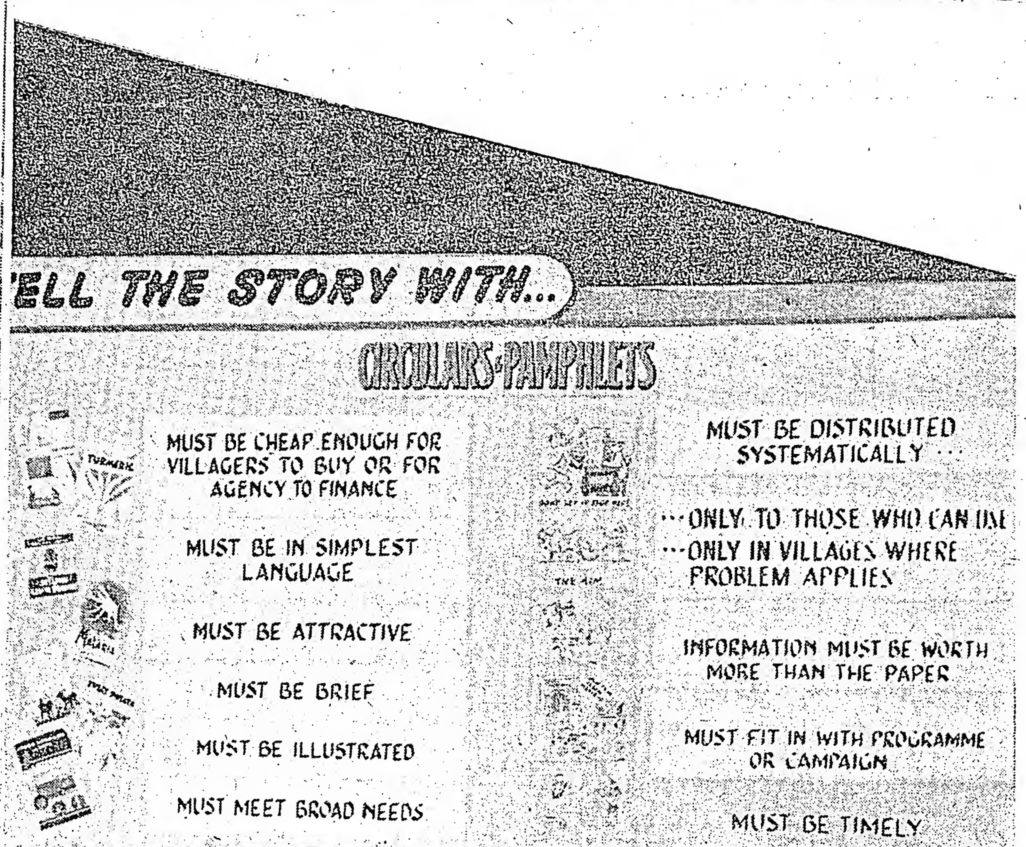


Technique of Flannelgraph a new medium

Literacy training devices exhibited

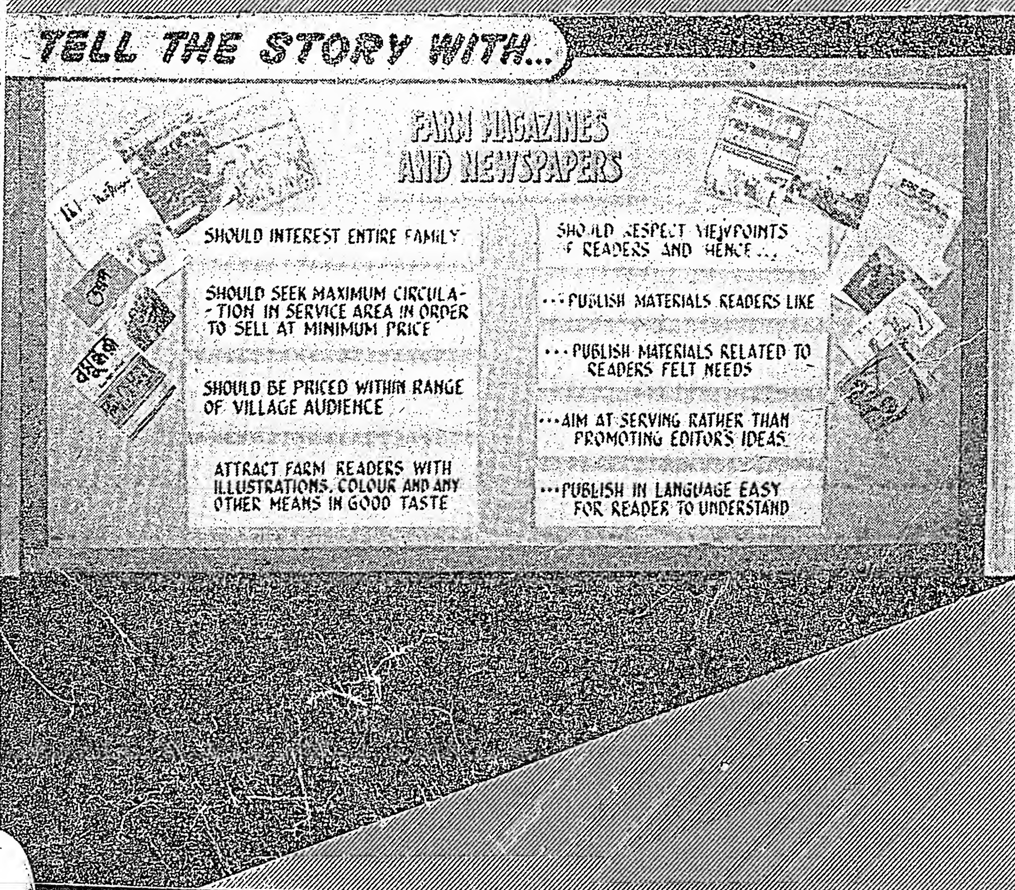


SINGH



One of the many panels in the media and methods exhibition

Use of different media was put across through such exhibits



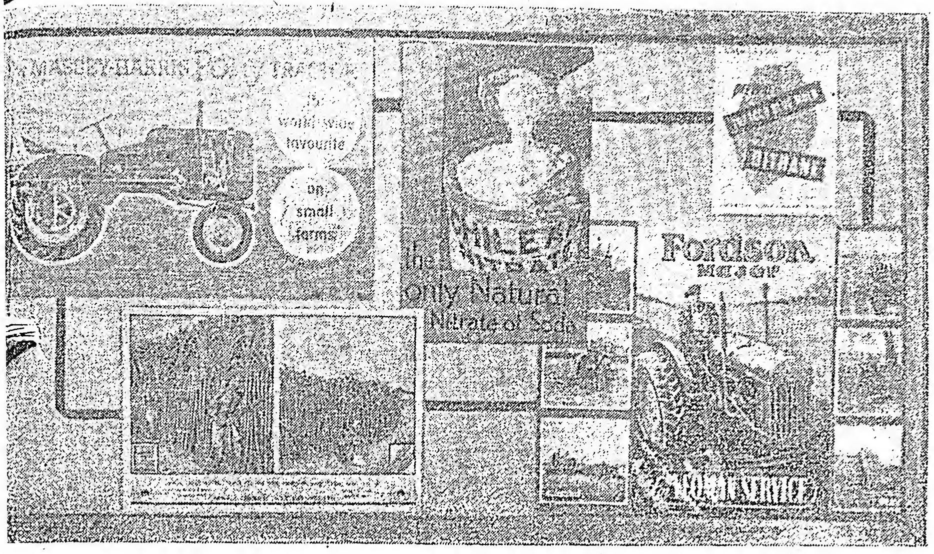
help the farmer to grow more and to live better.

The Conference, through its various committees, pondered over the question from all possible angles—why useful information does not reach the farmer and why, if he gets it, he does not make use of it, and how to inspire him to make use of it. The draft approved by a plenary meeting of the Conference provided that agricultural information committees should be set up at all levels—at the Centre, States, districts, Tahsils and villages. The Central Information Committee should have, besides official members, representatives of trade, farmers, Press, non-Government scientific workers and professional experts to serve on it, and should plan on an all-India basis, prepare and publish materials, organize national campaigns, etc. The State committees should ascertain the requirements of the State as a whole and arrange for production of material for distribution. The district committees would collect information and pass it on to the State committees and act as a channel of communication to the Tahsil committees which would act in a similar fashion in relation to the organizations above and below them.

In this coordinated manner, scientific information could be collected from research and experimental stations and made available to the farmer through extension workers, with the help and cooperation of all persons—official, non-official and the trades.

There is no doubt that the working of such a massive organization would require ample financial support. It is a happy augury that an atmosphere of extreme cordiality and cheerfulness prevailed throughout the discussions on the ticklish problem of finance, inspite of the fact that various interests were involved in these discussions. While the trades agreed wholeheartedly to participate in the move by placing all its equipment, and other resources, at the disposal of the new organization, the question of cash contribution was left to be determined by each individual firm. As regards help to the States, the I.C.A.R. agreed to take up the question directly.

With a view to exploring effective ways and means for making results of research available to the farmer



The trade section was attractively arranged

a "media and methods" exhibition was also arranged. Besides those means which were currently in use such as agricultural magazines, films, radio, etc. some potential means for disseminating agricultural information such as the flannelgraph, filmstrips, posters, cartoons, slides, circulars, etc. were also spotlighted in this exhibition. The delegates evinced keen interest in the exhibits displayed, particularly the flannelgraph which attracted a great deal of attention. Simple in construction and cheap, it could, with a little imagination, be effectively made use of in serving small to medium-sized gatherings.

Taking into consideration the limitations of the written word in conveying agricultural information to the farmer on account of his illiteracy, it was thought best to give priority to visual and auditory media—travelling vans exhibiting films, community listening centres and illustrated folders. It was admitted that it was impossible to reach every villager with the publicity folder. The purpose of printed literature would be largely served if it could brief the agricultural demonstrator and put him in possession of the various details so as to be able to give proper and timely guidance to the cultivators in their work. Moreover, journals dealing with agriculture, if they were to be of any use, should be popular in nature and should be written in the local language in an absolutely non-technical manner so as to be easily comprehensible to the layman.

Radio was recognised to play an important part in the spread of agricultural information. To enable the delegates to see for themselves how community listening affected the villager's life, they were taken to a village nearby where such a community listening to "Farm Forum"—a special rural programme broadcast from A. I. R., Lucknow to the farmers—was in progress. The listeners were observed to be taking keen interest in the programme and, one of them when questioned by a delegate, replied that the radio had done a lot of good to him and his village. It had provided solution to many of their baffling problems. They almost attached religious sanctity to these programmes. Rightly then, the Conference recommended to make the best use of this means of agricultural publicity.

The part played by agricultural demonstrations for the purpose of bringing home to the farmer what was new in agriculture was also emphasized. Many social functions such as Melas, fairs, etc. with which the farmer was inseparably linked, could profitably be utilized as places for holding these demonstrations. Agricultural exhibitions and demonstrations organized at such places would attract the attention of the farmer and give him a chance to know the benefits of adopting improved agricultural practices and urge him to increase his output. Such places could also serve as venues for campaigns that were designed to stimulate and maintain

(*Contd. on page 29*)

orse-hoe being used r inter-row cultiva- ion of Cotton at ivision of Agronomy Farm, I.A.R.I.

TWO MULTIPURPOSE IMPE

By

R. D. VERMA

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THOUGH the value of timely and thorough tillage operations is well known to our farmer, yet it is very seldom that he is able to achieve this objective. This is mainly because of the lack of suitable implements at his disposal. As he has largely to depend for various cultivation operations on a single rather inefficient implement, the country plough, he works at great disadvantages. No doubt, specialized implements to handle different jobs are available in the market but his present economic conditions will hardly permit him to purchase them. Nor would it be economical for him, because of the generally small size of his holding, to invest his money in implements which he cannot fully utilize throughout the year.

The experience of the author in the management of the Division of Agronomy Farm, I. A. R. I. has fully convinced him that if full use is made of two simple and inexpensive bullock-drawn implements, viz. the Furrow turning plough and the horse-hoe or bullock-hoe, it is possible to perform all the cultivation operations on the farm far more efficiently, speedily and at much less cost, than is possible with the country plough.

The primary object of this article is to indicate and describe the different operations for which these implements are regularly used in the Division of Agronomy, with a view to impressing upon our cultivators the great utility of these implements and to create the necessary interest in them to acquire them and make full use of them.

FURROW TURNING PLOUGH

Most of our farmers are familiar with this implement but unfortunately few have taken to it so far. This is possibly due to (*i*) the higher price of furrow turning plough as compared to country or Desi plough, (*ii*) the mistaken idea that it is too heavy for their bullocks and (*iii*) the lack of knowledge about its usefulness. Originally, the imported ones were rather expensive and perhaps not quite suitable for bullock power as they were designed for use with horses. But now, numerous types of foreign and Indian makes specially designed for use with bullock power and to suit the draft capacity of practically all types of bullocks, are easily and cheaply available in the market. Therefore, there seems to be no valid reason to persist with this prejudice. In all agriculturally advanced countries furrow-turning is the standard method of ploughing, be it with animal power or tractors. The usefulness of the implement will be clear from the following account:

For stubble ploughing: After the crop has been harvested considerable amount of plant residues in

the form of stubbles, fallen leaves and weeds are left in the field. They are valuable source of organic matter but only if they are incorporated back into the soil. Furrow turning plough is mainly designed for this purpose. As it cuts and turns over the furrow, the vegetable material on the surface of the soil gets buried, and on decomposition provides valuable food material to the next crop. Further, the roots of the weeds get cut and are exposed to the sun thus getting completely destroyed. It also has the further advantage in that it leaves the furrow well exposed to the action of the weather, promotes drainage and activates the micro-organism activity.

For making bunds and channels: Most of our farmers are fully conscious of the importance of small size plot for the economical use of the irrigation water or, in Barani areas, for conserving rain water. But as bunds and channels cannot be made with country plough, he has, either (1) to make them by manual labour or (2) to leave small plots with permanent bunds and channels or (3) to leave big size plots without making subplots. All these practices suffer from serious disadvantages. Making bunds and channels by manual labour is a slow and costly operation. Small plots with permanent bunds and channels are difficult to cultivate. Further, considerable area is lost under these permanent bunds and channels; worst of all, the weeds flourish on these bunds and channels and serve as convenient source of infection when crops are grown. These difficulties and disadvantages would vanish if he could make bunds and channels without much trouble and expense. Furrow turning plough is of greatest help to him in this task. How to make bunds and channels is described below :—

For making bund the plough is run 6—9 ins. on one side of the central line where bund is to be made so as to throw the soil onto this line. The plough is then worked similarly in opposite direction on the other side of the central line. A uniform bund about 12-18 ins. wide and 9-12 ins. high is thus made.

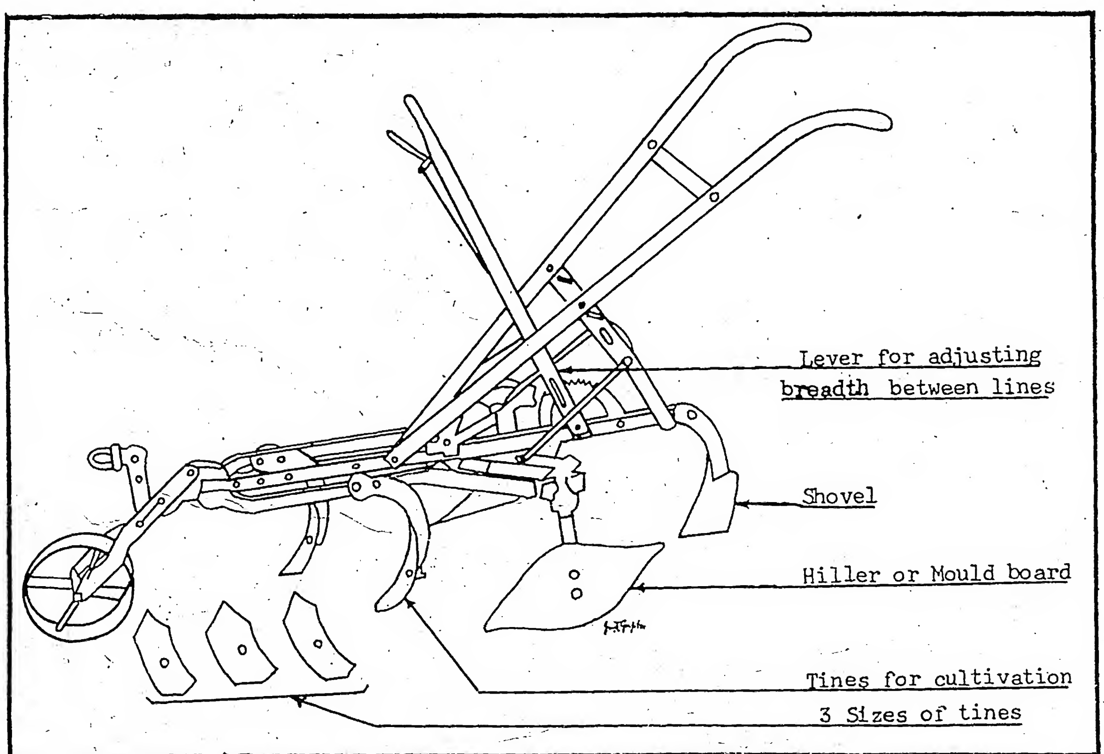
To make a channel the same operations as for bund making are performed; only the plough is run in both directions on the central line and the soil is thrown outwards. A channel is thus made. If deeper channels are desired the same operation can be repeated.

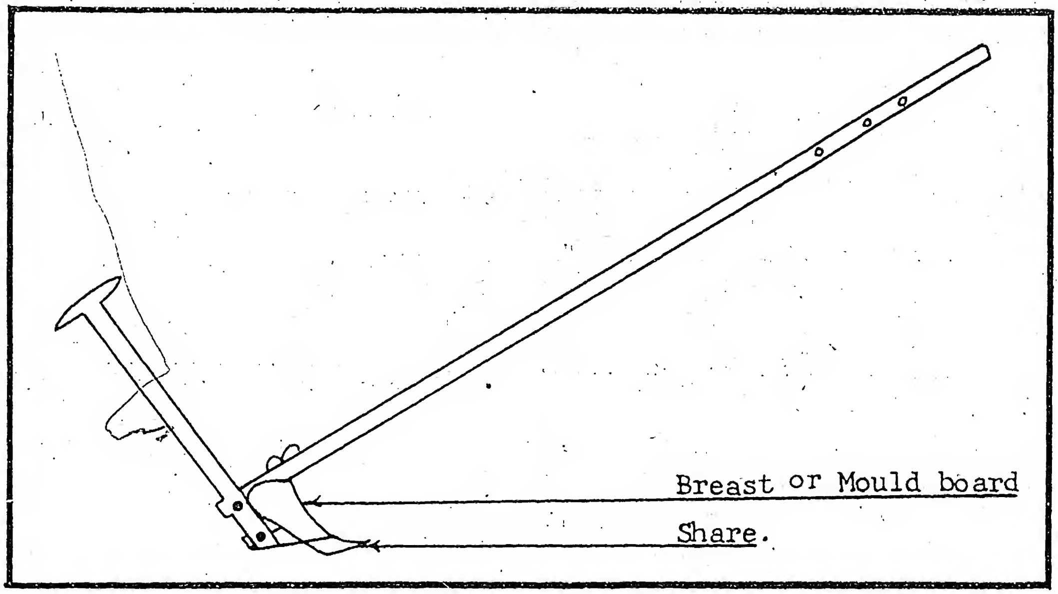
The benefits of ridging up tall growing crops like sugarcane are obvious. By providing the extra support at the base of the plant, lodging is considerably reduced. Further, in the process of ridging up, weeds in-between the rows get uprooted and along with those in the rows, get buried. Thus not only clean cultivation is the result but these buried weeds on rotting provide extra nutrients to the growing crop.

Ridging up is done in the same way as making

MENTS FOR THE FARMER

Horse-hoe or bullock hoe





Meston Plough (Furrow turning plough for small bullocks)

channels. Here, of course, the yoke has to be so adjusted that the bullocks can walk in between the adjoining rows to avoid plants being trampled.

When inversion of the soil is not required, as for example, in seed bed preparation, the breast or mould board can be detached. In this way, normal ploughing without inversion of the soil is done.

HORSE-HOE OR BULLOCK-HOE

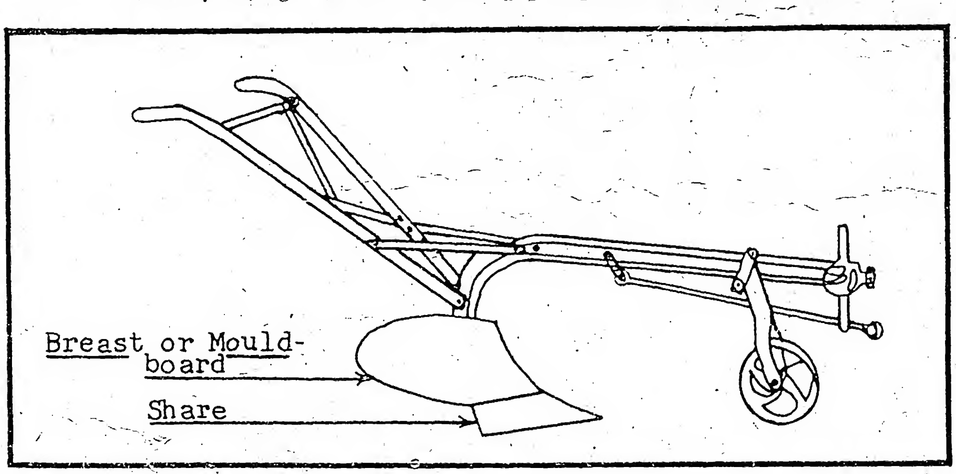
Whereas the furrow turning plough is slowly gaining popularity with our farmers the horse-hoe is comparatively unknown to him. This is most unfortunate because it is one of the most useful implements which he can possess. Previously, its high cost was one of the main factors which checked its popularity. Now, however, these implements are made in the country and the cost is no more than Rs. 100 or so. Considering the various operations for which it can be used, the saving in time and labour which can be effected and the high standard of cultivation which can be achieved with it, its present cost is certainly worth the farmer's money. It is a sturdy, simple and easily adjustable implement. Mainly, it consists of five or seven metal tines fixed to the iron frame. The tines are easily adjustable for depth as well as for the distance between them; it is the latter quality which makes the horse-hoe such a multipurpose and useful implement in the following ways:

For inter-row cultivation: The horse-hoe is primarily designed for this work. By simple lever movement the width of its working can be adjusted to suit the distances between the rows. As the metal tines cut the soil, the land is well cultivated and pulverized; the weeds are uprooted and brought to the surface.

For mulching: For conservation of moisture soil mulching is the most practical method. Horse-hoe does this job most admirably, as the tines can be adjusted to stir only the top ½-1 in. layer of the soil. Time is an important factor in moisture conservation, specially in Barani areas where, after showers of rain, moisture must be conserved quickly by soil mulching for the successful growing of crops later on. As the horse-hoe covers 3-4 times the area the country plough does in the same time, the work of soil mulching can be done very speedily with the former. This advantage is of enormous value in rain deficient and light soil

(Contd. on page 30)

Victory Plough (Furrow turning plough for strong bullocks)



ENSURING UNIFORM SUPPLY OF GREEN FODDER THROUGHOUT THE YEAR

By **R. T. GANDHI** and **P. M. DABADGHAO**, Indian Agricultural Research Institute, New Delhi

A LIBERAL supply of green fodder to milch cattle throughout the year is the keynote of successful and economical dairy farming. Besides being appetizing, easily digestible and laxative, green fodders supply the required type of vitamins in sufficient quantity and have a cooling effect on the body system. They constitute bulky food giving a feeling of fullness and, if given in proper mixture, can supply the necessary digestible nutrients to the milch animals thus reducing expenditure on the purchase of concentrates to a considerable extent. This is the reason why during the monsoon months, when there is lot of green grass available to the cattle, milk is plentiful. The secret of remarkable improvement in the milk yield, from daily average of 5 lb. in 1914 to over 20 lb. in 1951, brought about in the famous Sahiwal and Tharparkar herd at the Indian Agricultural Research Institute, lies in the great emphasis laid on the regular supply of green fodder throughout the year. A workable plan for the supply of fodder throughout the year evolved at the Institute on a five-acre plot under irrigated conditions has been discussed in the following paragraphs. This plan ensured a daily supply of a minimum of six maunds of green fodder sufficient to feed 12 average milch animals, and hence would be of great interest to those engaged in similar pursuits.

FODDER CROPS USED

The fodder crops used in the scheme were maize, cowpea, Sudan grass and soyabean as *kharif* annuals, berseem and *senji* as winter annuals and Napier and Rhodes grasses and lucerne as perennial fodder crops. The crops used therefore, are not new but what is 'emphasized' is the precision with which the details of sowing and harvesting are carried out in the plan.

LAYOUT AND ROTATION

The five-acre block was divided into 10 units of ½ acre each. Of these, three units totalling 1½ acres were kept under perennial crops, i.e, Napier and Rhodes grasses and lucerne (one unit each) with a view to filling up the gap in fodder supply which normally occurs during October, November and May and June. For the same reason, two additional units were kept under Sudan grass which affords a number of cuttings, followed by *senji* in rotation. Senji is ready for harvest in February or early March, leaving the plot ready for fresh sowing of Sudan grass.

The remaining five units were kept under maize-berseem rotation with early maturing soyabean (American variety) as a catch crop in two of the units.

The layout and rotation chart is given in table I.

TABLE I

Layout and rotation chart*

A Maize-cowpea Berseem	B Maize-cowpea Berseem	C Lucerne	D Napier grass	E Rhodes grass
F Maize-cowpea Berseem	G Sudan grass Senji	H Sudan grass Senji	I Maize-cowpea Soyabean Berseem	J Maize-cowpea Soyabean Berseem

* Each unit 0.5 acres.

SOWING PROGRAMME

As already pointed out, the success of the plan largely depended upon the precision with which the sowing programme was carried out. The important point in the scheme has been the successive sowings of maize in mixture with cowpeas, the main *kharif* fodder from April to July, which makes the fodder available from June to the middle of October. Another important point to be kept in view was the early sowing

of berseem in September so as to make it available by the end of November.

The perennial fodder crops Napier and Rhodes grasses and lucerne were sown once at the commencement of the scheme and thereafter the same stand was maintained for five years. The sowing programme adopted in the scheme is given in table II.

TABLE II*

	Months									
Weeks	February	March	April	May	June	July	August	September	October	November
1			Maize cowpea (I)		Maize cowpea (A)		Soy abean (J)			
2						Soyabeans (I) Maize cowpea (B)			Berseem (J)	
3	Napier (D)	Sudan grass (G & H)		Maize cowpea (F)				Berseem (F)	Berseem (A)	Senji (G & H)
	Rhodes (E)		Maize cowpea (J)				Berseem (I)	Lucerne (C) Berseem (B)		

* The units to be sown are given below the respective crops.

FODDER SUPPLY

The fodder was cut and supplied on weekly basis at the rate of minimum of 42 maunds per week, according to a tentative plan of supply prepared from the general experience with these crops. Table III presents the general plan of fodder supply followed from June, 1951 to May, 1952. Minor adjustments have, however, been made after the completion of one cycle, so as to evolve a suitable working plan for the supply of fodder throughout the year.

(*Please see the Table III on next page*)

From the supply table it will be seen that the successive sowing of maize-cowpea mixture, makes the fodder available throughout the months of June, August, September and the first fortnight of October; in the month of July, Sudan and Napier grasses are plentiful. Planned sowing of berseem makes this rich and palatable fodder available in full from the end of November to the end of April with a partial supply in May. The perennial crops have been useful during October, November and again in May, June and July. The inclusion of soyabean and *senji* gave additional quantities of fodder during the second week of September and the third week of March, respectively.

From the supply plan it will be observed that every month the fodder supplied was in excess over the scheduled quantity calculated at the rate of six maunds per day. The extra quantities supplied during the months of June, July, September and to a small extent in November can be made available for extra feeding of animals, while the excess of about 700 maunds of berseem supplied from February to April could be converted into about 200 maunds of excellent hay which could be advantageously supplied along with other green fodder during *kharif*, specially when the bulk is made up by comparatively less nutritive Napier and Sudan grasses. The same results can also be achieved by successional sowings of cowpea in the standing crops of Napier and Sudan grasses as shown by successful preliminary trials.

The fodder supply plan detailed above can be adopted for soils of average fertility with suitable manuring schedule and regular supply of irrigation water under climatic conditions favourable for sowing maize and berseem. The plan is being further examined with suitable alterations and modifications keeping in view the feeding requirements of the stock and the economic needs of the stock owners.

TABLE III

Showing the details of fodder supply in maunds per week

Months	Weeks 1		2		3		4		Total	Extra
June	Maize		Maize		Maize		Maize			
	cowpea	35	cowpea	39	cowpea	50	cowpea	54		
	Lucerne	17	Lucerne	17	Lucerne	19	Lucerne	19		
		52		56		69		73	250	70
July	Sudan	48	Sudan	63	Napier	41	Napier	42		
	Rhodes	27			Lucerne	12	Lucerne	13		
		75		63		53		55	246	60
August	Maize		Maize		Maize		Maize			
	cowpea	38	cowpea	37	cowpea	40	cowpea	40		
	Lucerne	10	Lucerne	10	Lucerne	9	Lucerne	8		
		48		47		49		48	192	6
September	Maize		Maize				Maize			
	cowpea	76	cowpea	68	Rhodes	20	cowpea	49		
			Soyabean	24	Lucerne	30	Lucerne	10		
		76		92		50		59	277	97
October	Maize		Maize							
	cowpea	48	cowpea	54	Sudan	50	Sudan	49		
		48		54		50		49	201	15
November	Napier	51	Napier	51	Lucerne	33	Berseem	53		
					Rhodes	17				
		51		51		50		53	205	25
December	Berseem	44	Berseem	46	Berseem	48	Lucerne	53		
		44		46		48		53	191	5
January	Berseem	59	Berseem	48	Berseem	48	Berseem	47		
		59		48		48		47	202	16
February	Berseem	53	Berseem	50	Berseem	122	Berseem	70		
		53		50		122		70	295	121
March	Berseem	145	Berseem	51	Senji		Berseem	53		
					Sudan	134	Lucerne	67		
					Berseem	72				
		145		51		206		120	522	336
April	Berseem	53	Berseem	93	Berseem	103	Berseem	179		
		53		93		103		179	428	248
May	Napier	50	Napier	55	Sudan	42	Berseem	78		
	Berseem	20	Berseem	27	Lucerne	24	Lucerne	24		
		70		82		66		102	320	134

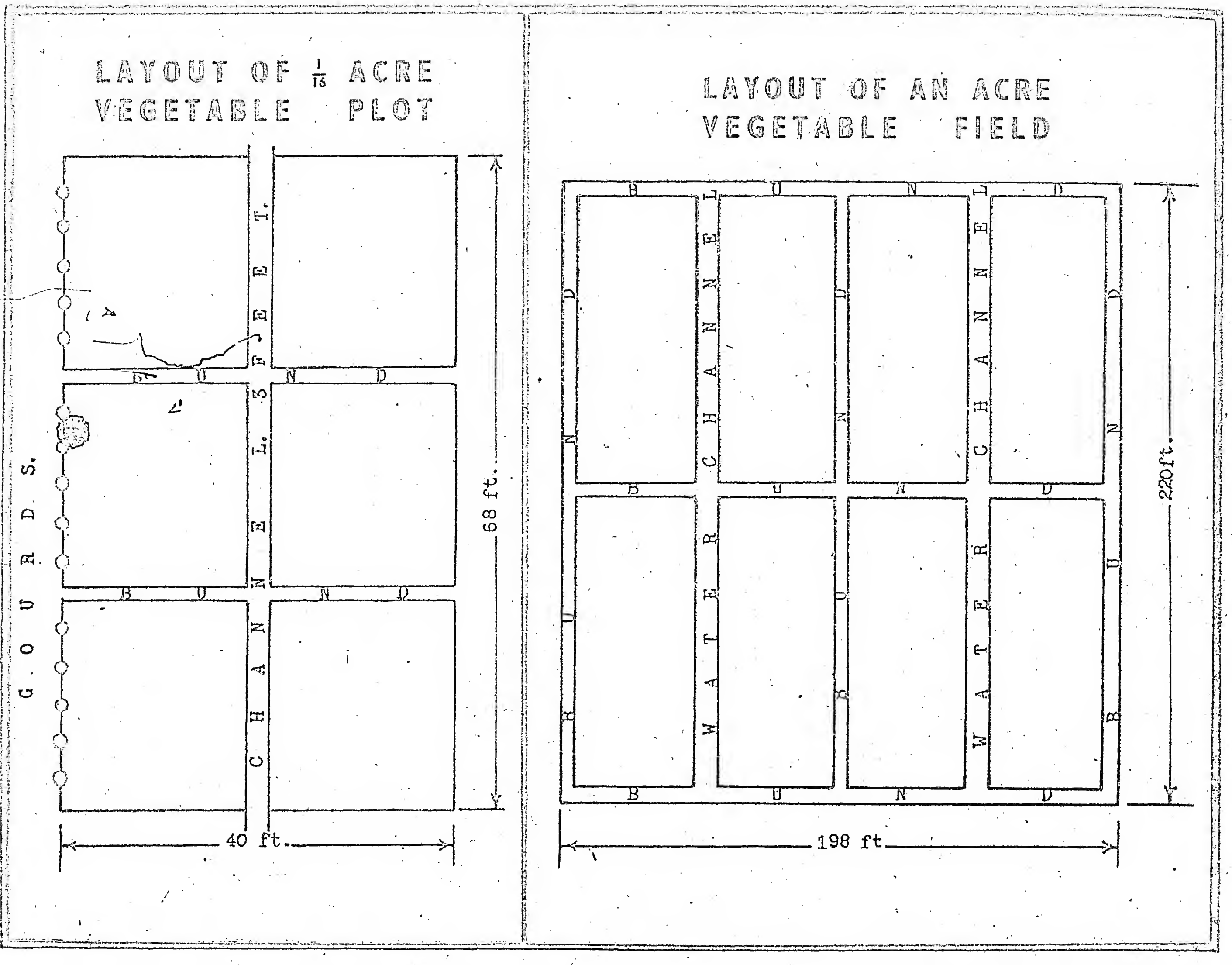
MAN OF THE MONTH

(*Contd. from page 6*)

agricultural authorities in the area should take many more farmers. Under the Madhya Pradesh Government Wheat Scheme, this farm is already treated as an authorised seed supplying farm and if Gadre's ambition is fulfilled, at no distant future the farm may be turned into a training centre for the farmers of the area, for demonstrating how mechanization can be brought about to the maximum advantage of the farmers. Last point but not the least important, is the emphasis on improved implements. Although Madhao Rao has a number of tractors and big machinery, he does not believe that these machines only can solve all the problems. After all, all the holdings cannot be as large as his and all the farmers cannot go in for heavy machinery. They can certainly go in for improved implements and there is no reason why advantage should not be taken of the Gadre farm as a demonstration centre for showing what even the smallest farm implements can do to help the farmer to increase his production.

—PUSHKAR OZA

 (*Contd. from page 9*)



on ridges except in the case of brinjal and chillies when the seeds are at first sown on well prepared nursery bed, about 3 × 5 ft., raised a few inches above the ground level. When the plants are about 6 ins. high, they are transplanted preferably in the evening, and are irrigated immediately afterwards. In dry and hot season, it is a common practice to pinch off a few leaves of chillies so that transpiration from the leaves may not exceed the water intake by roots. Otherwise the seedlings are likely to wilt and die. In certain localities, early sowing of chillies is done by dibbling the seeds. In the case of sweet potato cuttings are planted in the soil.

INTERCULTURE & IRRIGATION

Due to high temperature, Kharif crops require frequent irrigation. To some of the vegetables, irrigation is given twice a week, but generally, it is once a week. As far as possible, the plots should be irrigated in the evening. After the seeds have germinated the plants are hoed all-round and the vines are kept shifting in case of gourds, sweet potatoes, etc; hoeing should be done very frequently to check weeds and to loosen the soil.

FLOWERING AND FRUIT SETTING

On the vigour and strength of the plant depends its flowering. Better setting takes place when crops are cross-pollinated. This is generally done by insects or the wind. In the absence of insects, hand pollination is also practised which may be done by bringing the male flowers in touch with the female flowers in the morning.

SIZE AND QUALITY OF FRUIT

When there are too many fruits on one branch the size of the fruit will be small. In such cases thinning of the fruit is done in order to get better quality and better sized fruits. Two to four fruits on a branch usually give better sized fruits. This of course would vary from crop to crop and also with the health of the plant.

HARVESTING

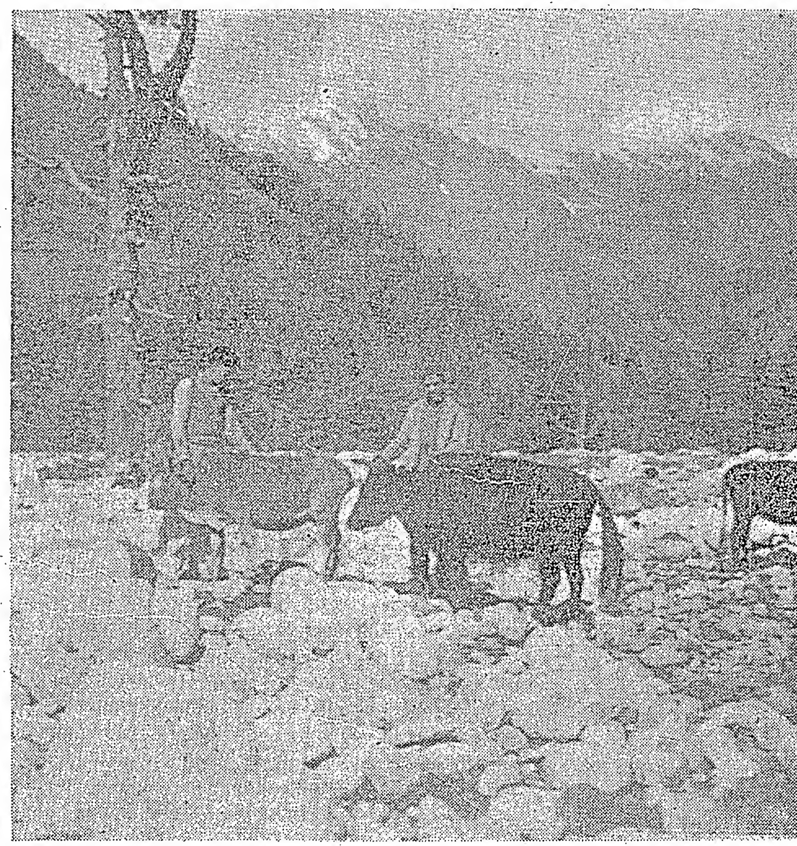
The stage at which harvesting is done depends on the nature of the vegetable sown and cooking requirements. In some vegetables harvesting is done when they are tender and unripe as in the case of some of the gourds and lady's finger, while in others like pumpkin and white gourd the fruit is allowed to ripen before plucking.

(*Contd. on page 31*)

Chart giving cultivation details of common Kharif vegetables

Name of crop	Season	Seed rate per acre	Method of sowing	Distance between rows	Distance between plants	Manuring, F.Y.M. cartloads	Harvesting	Varieties recommended	Remarks
Gourds									
Bottle gourd	Feb.-March, June-July	2 sr.	Direct on ridges	10 ft.	$1\frac{1}{2}$-2 ft.	20-25	May-Oct. Oct.-Dec.		Dibble 3 seeds in one hole & later increase the plant to plant distance to 3-4 ft.
Red pumpkin	Feb-March, June-July	do	do	14 ft.	2-3 ft.	15-20	do		do.
White gourd	June-July	do	do	10 ft.	2 ft.	do	Sept-Oct.		It does well on light sandy soils.
Chapan kadu	Jan.-Feb.	do	do	5-6 ft.	$1\frac{1}{2}$-2 ft.	do	April-May		
Squash gourd or vegetable marrow	Feb-March } June-July }	do	do	8-10 ft.	$1\frac{1}{2}$-2 ft.	20-25	May-Oct. } Oct.-Dec. }		Dibble three seeds in one hole & later increase the plant to plant distance to 3-4 ft.
Bitter gourd	March (2nd sowing in July)	do	do	5-6 ft.	1-$1\frac{1}{2}$ ft.	15-20	May-Sept.		
Sponge gourd or Luffa	Feb-March & July	$1\frac{1}{2}$ – 2 sr.	do	6 ft.	$1\frac{1}{2}$ ft.	do	May-Oct.		
Snake gourd	April & July	1 sr.	do	10 ft.	3-4 ft.	20	Aug.-Dec.		Dibble three seeds in one hole.
Fruit Bearing Crops									
Lady's finger	March-July	5, 6 sr.	Direct on flat beds	$2\frac{1}{2}$-3 ft.	1 ft.	20-25	May-Nov.	Sabour selection	Green and tender fruit to be cut otherwise the plants will stop bearing.
Brinjal	Feb.-July } Oct.-Nov. } (sown in nursery)	$\frac{1}{2}$ sr. $\frac{3}{4}$ sr.	Transplanted (Apr. Sept. & Dec.-Jan. on ridges or flat beds)	3 ft.	1 ft.	Moderate	Apr.-Aug. & Sept.-Dec	(1) Sirbindi long purple (2) Round purple	The October planting is heavy yielding.
Cucumber	Feb.-March	$1\frac{1}{2}$ sr.	Direct on ridges	5 ft.	1 ft.	5-10	May-June		
Long melon	Feb.-March	do	do	5 ft.	1 ft.	do	do		
Melons	March-April	2 sr.	do	6 ft.	1-$1\frac{1}{2}$ ft.	do	do		
Water melon	March (2nd crop, July)	3-4 sr.	Direct on ridges	6 ft.	1–$1\frac{1}{2}$ ft.	do	(June-July) (2nd crop, Oct.)		Usually no manure is applied but sometimes large pits are dug & a small quantity of manure is applied.
Squash melon	Middle Feb. to April (2nd crop June to July)	2 sr.	do	4-5 ft.	do.	16	May-June & Oct.	Green & pale yellow.	Dibble 3 seeds in one hole & increase plant to plant distance to 3 ft.
Root Crops									
Arum	End of Feb. to April	12–15 md. of tubers	do	$2\frac{1}{2}$ ft.	6 — 9 ins.	16	July-Oct.		When the leaves begin to turn yellow dig out the tubers.
Sweet potato	June-July	20,000 to 30,000 cuttings or 7-8 md. of cuttings	Cutting 1-2 ft. long sown on ridges	$1\frac{1}{2}$-2 ft.	1-$1\frac{1}{2}$ ft.	8	Beginning of Dec.	(1) F.A. 17 (2) Golden skin YAM	Vines should never be allowed to root in the soil.
Aromatics									
Chillies	Oct.-Nov. (in nursery)	2 sr.	In nursery, (transplanted in Feb. & March in rows)	18 ins.	1 ft.	15	Sept.-Nov.	(1) World Beater (2) Bell Pepper	
Turmeric	March-April	10-12 md. of rhizomes	On flat beds.	2 ft.	1 ft.	30-40	Nov.-Dec.		Select pieces of rhizomes with 2-3 eyes & dibble them 3 in. deep.
Ginger	March-April	10-15 md. of rhizomes	do	1 ft.	1 ft.	do	do		It requires free working soil.
Spearmint	March or rainy season					Fresh dung is considered to be good manure	Throughout the year		Sown in small beds by planting runners.

SHEEP IN THE HILLY REGIONS OF UTTAR PRADESH



Right—*Yohini, Yak bull cross with hill cow* (left)

By
H. K. LAL

WITH a view to launching large scale sheep development in the hills of Uttar Pradesh, an extensive survey of the sheep and wool produce has been made. This survey has revealed that in Tehri-Garhwal and upper Almora (near Pindari Glacier) most of the hilly sheep belong to the stock that corresponds favourably with the Gaddi sheep of Kangra and the Kulu valley. But, the quality of wool and size of the animals vary according to climate and habitat. A fair amount of admixture of various breeds seems to have taken place. This may be due to the fact that nomadic breeders from Himachal Pradesh, Garhwal, Almora, Tibet and Bhutan keep on moving with their flocks from one place to another. The Tibetans bring with them Biangi sheep and Pashmina goats which are well known for the fine quality wool and Pashmina, respectively. The Yak and Yak

crosses are commonly seen and are very popular with the local people. The male cross is usually sterile, but on account of its strength and vigour it is used as a beast of burden. The famale is liked for its high yield of good quality milk.

The Jads, a typical nomad tribe of Tehri district, move between the plains of Rishikesh and the heights of Harshal, about 23 miles from the border of Tibet, which is their headquarters. Sheep is the mainstay of their economy. Work connected with all phases of wool production, right from the breeding of sheep to the spinning of wool, provides occupation to them. Only weaving is entrusted to another community living with them. The nomadic breeders move to the border districts either for grazing their sheep or for the purposes of trade they bring their goods on sheep and goats as these provide the only surer means of transport in these high hills. The mule in-spite of being very sure-footed, has failed to scale these heights.

LUCKNOW INFORMATION CONFERENCE IN RETROSPECT

(*Continued from page 19*)

enthusiasm among the rural population.

There is no doubt that the delegates worked very hard and it is hoped that concrete results would ensue as a result of their deliberations. The usefulness of the information machinery thus evolved would be assessed at a Convention again to be held after a year whereat efforts will be made to improve this organization in the light of experience gained. The success of this organization would depend upon the willingness of the farmer to accept it as his own. This would in turn depend upon the way this machinery is handled.

 (Contd. from page 22)

areas where frequent stirrings of the soil will not only conserve the soil moisture but also help in absorbing and retaining much of the rain water. Frequent cultivations keep down the weeds and thus save further losses of soil moisture due to traspiration.

For seed bed preparation: For preparing the seed bed quickly, e.g. for sowing of *kharif* crops after the first showers of rain, and where the land has already been ploughed up once with a furrow turning plough the horse-hoe comes in very handy. Much quicker and thorough seed bed preparation is possible with it. Moreover, as already stated, it uproots and gathers the weeds which can be collected and destroyed. Thus a cleaner and better prepared field for sowing is obtained.

For weed control: It is not an uncommon sight to see the fields left fallow by the cultivators full of weeds. If the weeds are allowed to grow unchecked the purpose of fallowing—to increase the fertility of the land and conserve the moisture—is completely defeated. On the other hand, because the weeds have usually very vigorous vegetative as well as root growth, more nutrients and soil moisture may be consumed by a "crop of weeds" than by a cultivated crop. The only way to keep down weeds in fallow lands is by frequent cultivation. A cultivator equipped with a horse-hoe is naturally in a far better position to give frequent cultivations as it is a speedy device. Clean fallow is of vital importance in Barani areas.

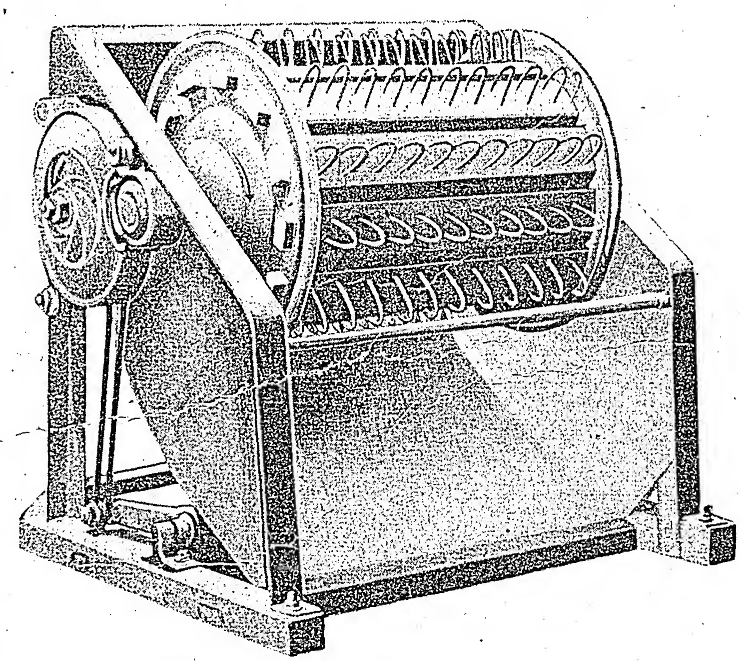
For earthing up: Good makes of horse-hoe are normally provided with extra attachments for the purposes of earthing up. These attachments consist of two simple mould boards or hillers and a broader tine or shovel. When the implement is to be used for earthing up, the two outermost tines are replaced by these mould boards and the backmost tine by the broader tine. In operation, the front tines loosen up the soil and the two mould boards throw the earth outwards, thus earthing up the crop in the row. The back tine gives a further cultivation in the channel, thus uprooting any weeds which may have escaped the front two tines.

As a seed drill and placement of fertlizer drill: The horse-hoe can be easily converted for sowing of practically any row crop or for placement of fertilizers. The few simple modifications and additions required for the purpose have been illustrated and described in detail in the July 1952 issue of *Indian Farming* in the article on "A simple device for the placement of fertilizers." As already stated, depth and width of tines can be easily adjusted. This is of great advantage because it enables the modified implement to be used for sowing almost any crop at a desired depth or for placing the fertilizers at any position in relation to the seed.

To fully capitalize this advantage an automatic horse-hoe seed drill is being developed by the author. This will be described in a separate article in due course.

CONCLUSIONS

From the above account, it will be seen that if full use is made of these two implements, practically all the tillage operations, can be done far more speedily, efficiently and cheaply. The implements are simple and sturdy and inexpensive to purchase and maintain. Their combined cost is not more than Rs. 150-250. Their benefits are manifold. They are certainly worth any farmer's money who is interested in better farming and getting increased profits from his land.



NEW SIEVE FOR SCREENING TOWN REFUSE COMPOST MANURE

(*Contd. from page 14*)

injuries to the feet of bullocks and men during cultivation and tillage operations. The third defect is that the farmers have also to pay for transporting nearly 20-25 per cent of foreign matter mentioned above. These transporting charges can well be saved if this compost is screened before being delivered to the farmers.

An effective sieve for this purpose has been designed by the author after considerable experimentation. It is cheap, effective and simple in construction. It consists of a circular sieve of expanded metal, 1½ ft. in diameter and 4 ft. long, mounted on an angle iron stand inclined at both the ends. At the higher end is placed a galvanised steel sheet hopper and a handle to rotate the sieve. At both the ends cast iron bearings are fixed. The sieve is mounted on two stands at the time of working. It can be easily transported from one compost pit to another by two men. The inclination of the hopper is such that the compost manure whether dry or moist easily slides down into the sieve. A labourer should be employed to rotate the handle; he should be instructed to rotate it slowly and not too fast. It has been noticed that at less speed the sieving-operation is more efficiently done than at high speed.

A mixed gang of four men and six women working for eight hours a day can dig out, sieve, load and unload from a truck about 9 to 12 tons of sieved manure, depending upon the distance to which the compost is carried. In the above instance, the distance is taken as four to five miles. This sieve is not primarily meant for saving any labour. Its main purpose is to attain maximum efficiency in sieving without increasing the initial or the working cost. It separates the real manure perfectly from the foreign matter.

These sieves are being mass manufactured at the Government Central Workshop, Sadar, Nagpur (M.P.). An order for nearly 114 sieves has been placed, out of which nearly 50 have already been supplied to the various municipal committees in Madhya Pradesh. The cost of each sieve comes to nearly Rs. 100, F.O.R. Workshop, Nagpur. The transport and packing charges are extra to the extent of Rs. 35-40. Orders for the sieves may be addressed to the Superintendent, Government Central Workshop, Sadar, Nagpur (M.P.). Any one interested in manufacturing these locally may get a copy of Bulletin No. 39 of 1952, (Agriculture Deptt.) from the Government Printing Press, Nagpur, Madhya Pradesh. It is entitled (New Implement Series No. 2) 'A new sieve for screening town refuse compost manure' and costs As. 4 per copy. It gives a complete set of five engineering drawings so that intending firms can easily manufacture the sieve locally.

It is hoped that the sieves will be used by corporations, municipal committees and local bodies thus giving the farmers full advantage of good quality compost manure, which is so very essential to increase our food production. Further information, if required, may please be obtained from the author

HINTS TO THE FARMER

(*Contd. from page 26*)

PESTS AND DISEASES

Vegetable crops are badly affected by insects specially in the early stages. As soon as some pest or disease appears on a plant or group of plants, it should be immediately attended to. If the plant is attacked by virus, it should be removed in order to save other plants from similar attacks. Diseased plants should be collected from the plots and burnt.

[*Please see the chart on page 27*]

ARTIFICIAL INSEMINATIONS AT KARNAL

(*Contd. from page 11*)

ITINERARY OF THE STOCKMAN

Each stockman has been assigned definite number of villages where he has to do this work. He carries on a cycle the following: vaginal speculum; 2 cc. syringe; vulcanite nozzle; home-made thermos-jar with semen vials in it; a small rope and a towel. He leaves the head-quarters at 6-30 A.M. and visits the village under his charge. The common place where all the cattle of the village are brought together before proceeding to the grazing land is the place of operation for the stockman. Animals in heat are spotted and with the help of the owners or cowboys, they are inseminated. Sentimental objections are overcome by the good propaganda work done by the inspector who visits these villages very often and convinces the people about the benefits of artificial insemination.

CARRIED OUT IN KARNAL & SURROUNDING VILLAGES

Name of village.	Distance from A. I. centre (in miles)	Operating Stockman	Cows census figures	Number inseminated	Buffaloes census figure	Number inseminated
Karnal	1	Lachman Singh Jagidish Rai Surendar Mohan	1197	818	1001	336
Pusgarh	3	Devraj	109	28	105	23
Kalveri	6	,,	106	51	95	11
Navel	6	,,	180	120	72	41
Buda Kheda	4	,,	67	20	60	5
Mangalpur	3	,,	63	48	32	21
Tikri	4	Prem Nath	96	22	107	13
Baldi	2	,,	92	19	116	12
Uchana	6	,,	159	125	225	48
Junjadi	6	Iswar Dayal	55	17	87	19
Shamgarh	8	,,	155	124	296	50
Benikurd	9	,,	74	14	151	15

EDITOR'S PAGE & EDITORIAL NOTES

(*Contd. from page 3*)

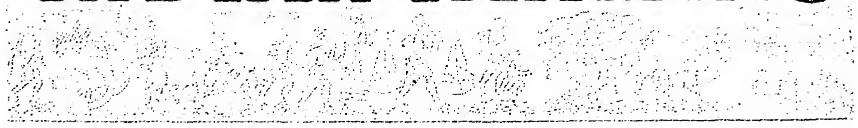
No doubt every one cannot get such phenomenal rise in production but these results certainly rekindle the hope that the soil in India is capable of producing a little more if properly tended. It might not be possible to raise as much crop as these Krishi Pandits have done but there is no reason why the present low yield in the country cannot be raised substantially. This poser presented by the Prime Minister to the country in his convocation address needs to be considered carefully. Economics of agriculture may not justify the spectacular rises but it will not be against a country-wide effort in adopting improved cultural practices to produce better results.

The Krishi Pandits did not rely on any extraordinary methods of cultivation. Sound agricultural practices which have stood the test of time and a judicious use of manure and fertilisers are the secret of success of these heroes. Surely right guidance in this direction will not be wasted.

★

" The article 'Gold in Our Gardens' which attracted codsiderable attention, contained infomation on the uses of a small organe-like fruit referred to therein as a Kumquat. The fruit is, however, known by a number of names, some of which are more familiar such as China Orange and Hazari."

INDIAN FARMING



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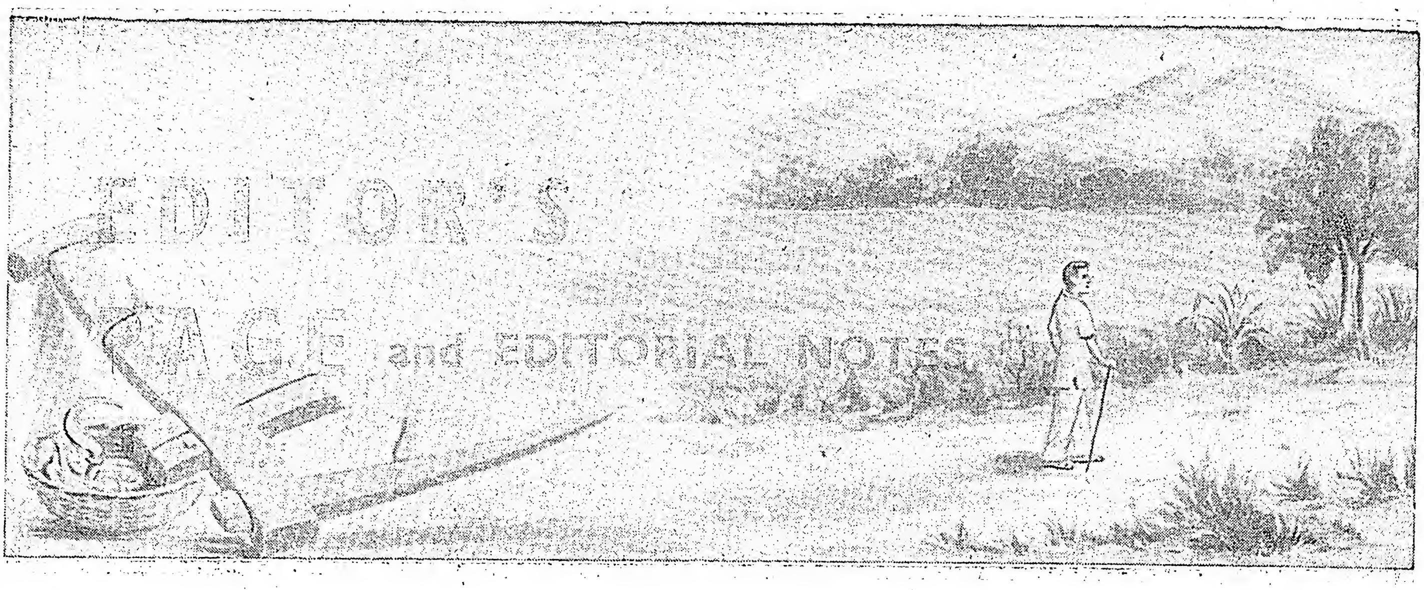


STEPPING UP RICE PRODUCTION

In a recent broadcast from the Delhi Station of All-India Radio Dr. Punjabrao Deshmukh, the Union Minister of Agriculture, stated that by following the Japanese method of rice cultivation 8,000 lb. of paddy per acre had been raised in the Thana district of Bombay State as compared to a comparatively low normal yield.

Introducing this subject the Union Minister has called upon the agricultural authorities in the country and the cultivators to take to this new method and launch a drive for increased production of rice.

India is the second largest country in the world with regard to the production of rice and has the largest area under this crop. However, when it comes to the average yield per acre, we tend to go to the bottom rung of the ladder. Thus although rice is a staple diet of a large proportion of our population, we are not self-sufficient in this particular crop.

Experiments have been going on in various parts of the country on methods for increasing our normal production, and the record crop produced by two of our farmers in the last two crop competitions confirms the belief that if we adopt improved methods of cultivation, our production will be considerably stepped up. Undoubtedly no country could take the record competition figures and turn these into normal averages, but if the cultivators are urged to derive inspiration from the work of Krishi Pandits, we can considerably step up production. The new method recommended by Dr. Deshmukh is called the Japanese method, although most of the steps contemplated comprise improved cultural practices known to cultivators. These improved agronomic practices have already been successfully tried in and recommended by some States in this country. However, there are one or two points which require to be spotlighted for countrywide application. These are low seed rate and heavy manuring of the crop in the seedbed and in the field. Taking step by step, the main features of this method of paddy cultivation are as under :—

(1) Raised seedbed for growing rice seedlings.

(2) Low seed rate.

(3) Heavy manuring of the crop in the seedbed and in the field.

(4) Transplanting paddy in rows in the field.

(5) Transplanting 4-5 seedlings per bunch.

(6) Interculture in rice fields, especially 'mulching', i.e. disturbing the soil round the roots of the plants.

The advantages of raised seedbeds for growing rice seedlings have been stressed by Agricultural Departments in some States. As regards the low seed rate, recent experiments on spacing-cum-seedlings per bunch

in transplanted paddy carried out in Bombay have confirmed the recommendations of the Japanese method.

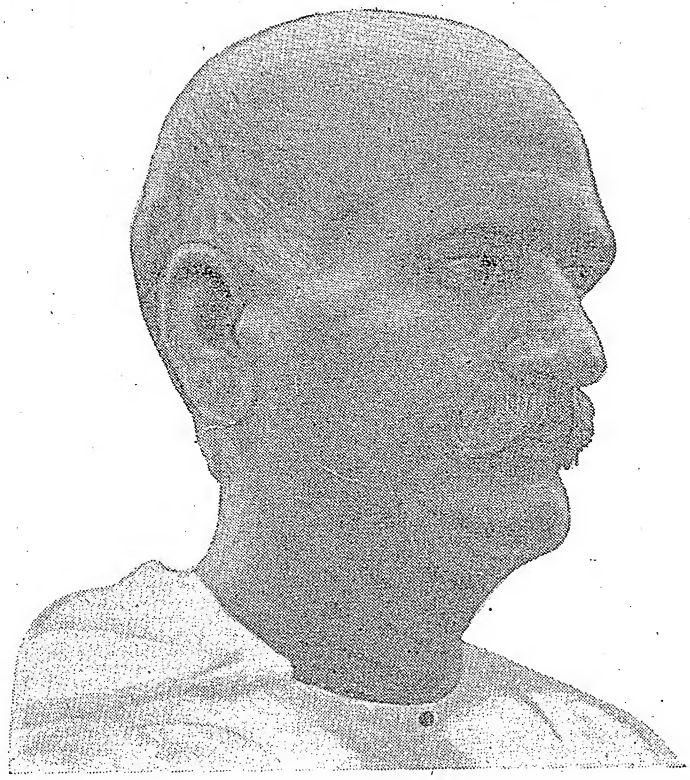
The Union Ministry is planning a countrywide campaign for the adoption of this method and has decided with the cooperation of the authorities in all the States to make available to the cultivators in the country the "Know-how" and "how-to-do" technique to enable the willing cultivators to take advantage of this method in the ensuing paddy season. To be effective, the campaign material will have to be made available to any cultivator who desires to adopt this new method. It is quite conceivable that if properly approached, a majority of cultivators would be interested in increasing production of paddy. The responsibility of convincing the farmers about the usefulness of this method would in that case rest with the field workers in the paddy growing areas. The campaign should be so planned as to plant the ideas relating to the Japanese method firmly into the minds of the cultivators. It is by doing so that the foundation can be laid for the successful adoption of this method.

The interest shown in this method by the Finance Minister and the Union Minister of Agriculture gives it a flying start. It will now be upto the field workers to ensure that their efforts do not lag behind.

OUR COVER

SOUTH INDIAN VILLAGE SCENE

The cultivators bring their cotton to market and the dealers pack it first into hundred pound bags. These bags are then sewn into three hundred pound bundles and loaded on to oxen carts and taken to the mills or the railheads.



Shri Bhagwan Din, the brain behind the farm

MILK MAN'S SON RAISES RECORD

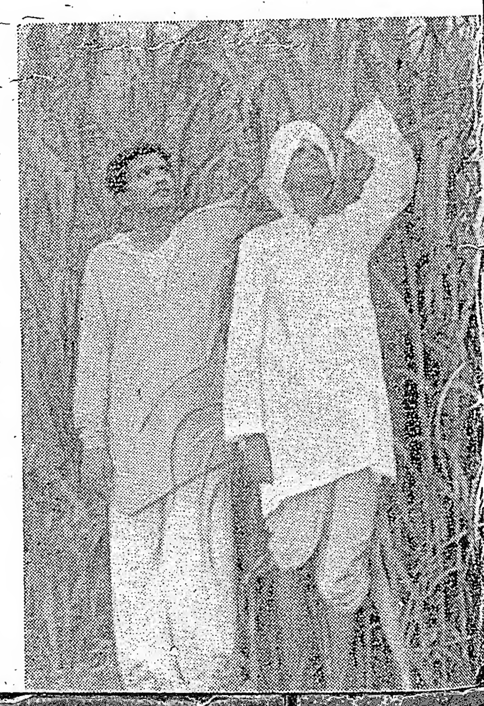
By
A. R. VYAS

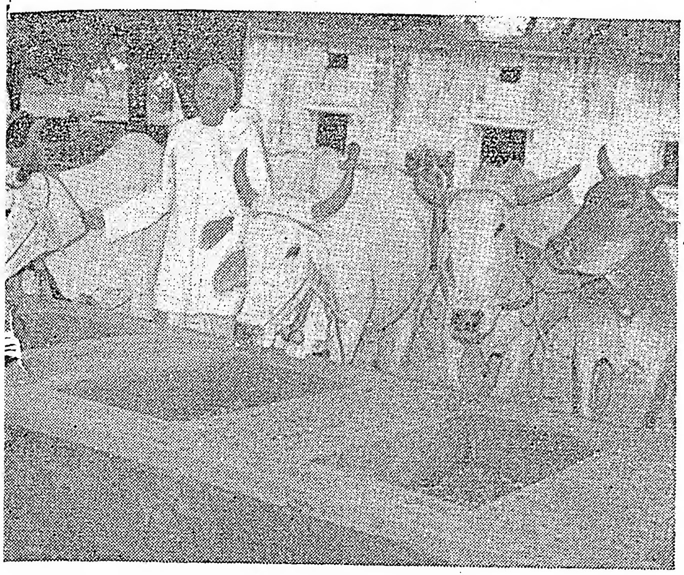
ABOUT 13 miles from Allahabad, across the Ganga lies village Sewait along a motorable road. As Shri K. K. Gupta, District Agricultural Officer of the district drove me in his car to the village one September morning, I saw miles of green fodder fields, the tall growths of which had been washed clean by the rain which had fallen incessantly on the previous day. The skies were still grey with moisture-laden clouds, but I had an appointment with Sukhia Ram who had raised over 54 maunds of wheat on his one-acre plot and won various prizes for his wheat yield. I would not have missed the opportunity for all the fury of a torrential downpour. And luck was on our side; Varuna held in check his watery hordes during the four hours that we spent at Sewait.

After about 45 minutes' pleasant drive, our car stopped near a fairly large house built of brick and mortar, at the entrance of which was a wide open space. The house was in marked contrast with the not too-distant mud huts which clustered in haphazard fashion under a clump of large trees. On hearing the sound of our car, a tall, well-built farmer dressed in clean home-spun, came out and greeted us. He was introduced to me as Bhagwan Din, the "brain behind the farm" and the eldest of the 4 sons, whom Mata Badal the Gowala (or milkman by caste) had left behind, on his death in 1923.

When Mata Badal died, he left the family 11 acres of land; today the family owns 45 acres; in addition, these Gowalas have a flour mill, a chaff cutting machine, a rice hulling machine and a machine for the manufacture of lime, all of which are run by an oil engine. The family has renovated its house and owns a sizable herd of cattle. Much of the credit for this prosperity goes to the eldest son, Bhagwan Din. Early in life he took service under Metropolitan Church Association, an American Mission which still runs a hospital and a fair-sized agricultural farm at Sewait. Young Bhagwan Din worked in the mission dairy, and on the farm for 26 years. During all these years he not only worked hard and conscientiously, but also picked up knowledge which he was to put into practice later. For his work he earned the gratitude of his employers; they sold him machinery and mills at a nominal cost; his knowledge of agriculture he turned to good account on the family lands. Came World War II and Bhagwan Din took

Sukhia Ram examining his fodder crop. Beside him is his nephew





Well-fed animals help in ploughing the fields. Feeding time for bulls

up contract work in building the airport at Phaphamau; the returns were good, and the earnings went to swell the size of the family holdings of good, agricultural land. As I talked to this enlightened farmer, I noticed the tone of regret in Bhagwan Din's voice, when he said, "We have 45 acres, but they are in scattered plots; the largest single block is 6 acres. If we only had the whole area in one compact block!"

SUKHIA, A TYPICAL FARMER

While his elder brother was picking up improved methods of agriculture and dairy farming under his American masters, or making a quick fortune on the aerodrome at Phaphamau, Sukhia Ram the second brother continued to cultivate the family lands, under the advice and guidance of one more experienced than himself.

Sukhia is a typical Indian farmer; shy but shrewd; illiterate but well-versed in agricultural practices; suspicious of "new fangled" ideas but quick to adopt new methods which have proved their utility; hospitable, kind and with a deep attachment to his cattle and his land.

When I spoke to this 48-year old son of the soil, asking questions about his family, his lands, his animals and the methods he had employed, he was reserved in the beginning. Perhaps he was shy or was it suspicion of the "man from Delhi?" But when I had joined the male-members of the family in their meal, the villager's reserve gave way to a friendly fellow feeling which helped me in my enquiries. I still have a suspicion, however, that but for the presence of Shri K. K. Gupta who had won the affection of the farmers of the area by identifying himself with their interests, the brother would not have been so frank with me.

METHODS USED

As in the case of other farmers, who have achieved outstanding results in crop yields, I found that Sukhia Ram too had manured his field heavily. From the conversation I had with Bhagwan Din and Sukhia Ram, I pieced the following story of success. The prize plot entered for the wheat competition is one acre in extent and stands in Sukhia Ram's name. The plot was sown under *senai* in June, 1951, which was ploughed with the field in August with a "Victory" plough. This was followed by 2 ploughings with a *gujar* plough and 12 with a *desi* plough. Then came 14 "patangs" (plantings). All these ploughings were completed before October 26, 1951. The land was then enriched with 90 maunds of farmyard manure and six more ploughings were given.

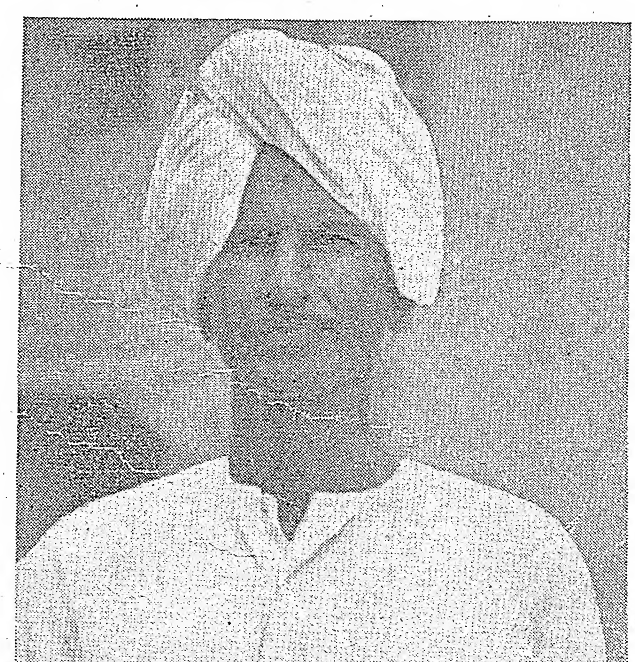
Wheat C13 obtained from the government's basic seed store was sown at the rate of 34 seers per acre. The method used was of dropping seeds behind the plough. The first irrigation was in mid-November; a little earlier, 25 seers of ammonium sulphate were broadcast. A second watering was given on December 15. A few days later weeding and hoeing was completed. The crop which was harvested on March 20, stood $4\frac{1}{2}$ ft. in height and yielded 54 maunds, 5 seers, 5 chhatacks. This is more than 5 times the average yield of the State and beats last year's record of the district by nearly 20 maunds!

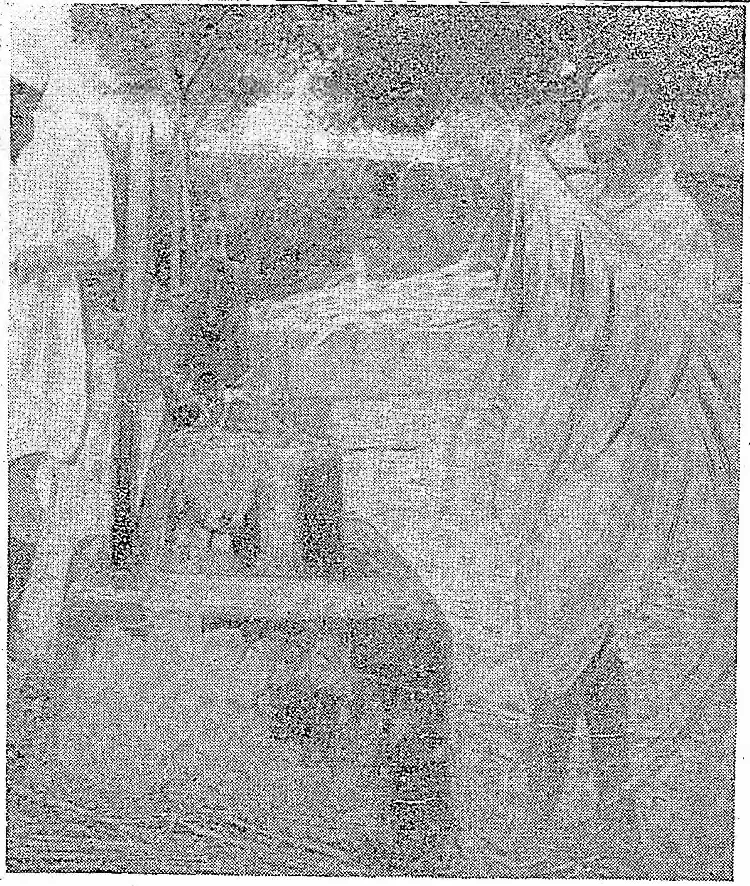
For this record yield, Sukhia Ram has won the Tehsil prize of Rs. 100, the district prize of Rs. 1,000 and the State prize of Rs. 5,000.

EXPENDITURE AND INCOME

It is one thing to invest heavily in a plot of land entered for a competition, quite another to see that it pays a handsome return. No true Indian farmer would care for kudos for its own sake, but he would spare no pains to raise a bumper crop on his fields. Sukhia Ram was no exception to the rule. I asked him what return he got on his acre of wheat. Assisted by his elder brother and the District Agricultural Officer, he worked out the costs of production which came to about Rs. 400. The income from the sale of wheat and *bhoosa* approximated to Rs. 1200 which left a handsome profit of Rs. 800 for the acre. But what cannot be expressed in terms of money, is the joy of having achieved distinction which shone on the faces of the four brothers who sat round me.

Shri Sukhia Ram





Self-help is the family motto. Sukhia Ram cutting fodder for his cattle

I asked the brothers what they intended to do with the prize money. Pat came the reply almost in unison: "We shall sink a well. No doubt our fields are irrigated by a canal, but since they are situated almost at the end of the channel, often the supply is insufficient."

"Was there anything else, which wanted immediate attention ?" I asked. There was a hurried exchange of looks between Bhagwan Din and his younger brother, before the older of the two replied. "We have an idea of levelling some of our fields, and if after this, there is money left, we can add another room to the house. Ours is a growing family."

"How many ?" I asked.

"All told, we are 40 people and the youngest is only two weeks old."

They were keen to tell me about their family affairs. Sukhia, the wheat champion had three sons, two of whom worked on the fields. The third had "taken to city life" and worked in the R. M. S.

I broached the subject of education a little hesitantly, and was surprised to learn that despite the fact that Sukhia Ram was illiterate, all those who came after him in the family hierarchy were literate, including the girls. Bhagwan Din was emphatic that education opened up new horizons and broadened "even a farmer's outlook."

He told me that the crops sown on their lands were *bajra*, *jowar*, paddy, *mung* and *urad* during Kharif, and wheat, gram, barley, peas and potatoes during Rabi.

One last question I asked my kind hosts before I bade them goodbye was what assistance, if any, the government could give them. They prefaced their remarks with unstinted praise for the village seed store, which they felt was a great boon to them. They wanted, however, more coal for burning bricks to line their water channels, pumps for drawing water, and irrigating their crops at the proper time and improved implements for their agricultural operations. Modest demands, I thought, but what a difference they would make to agriculturists all over the country, who despite difficulties, are fighting the battle for economic freedom.

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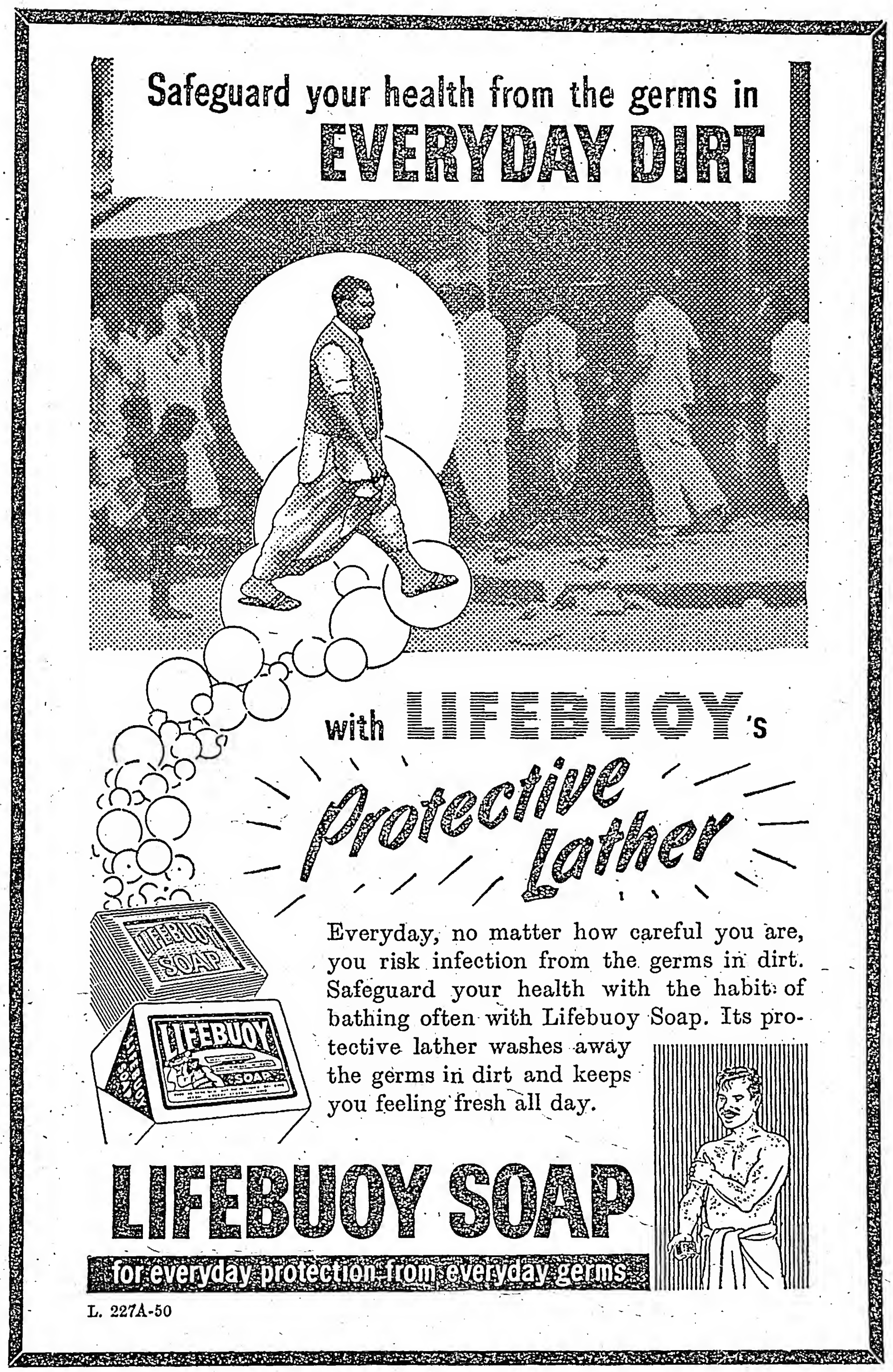

ical

s to the farmer:

By

P. C. RAHEJA and K. P. MISRA

TOBACCO growing is an art in which the cultivators of certain tracts have specialised. In the Guntur and Rajahmundry districts of Madras State cigarette tobacco is a speciality. Bidi tobacco grown in the Charotar tract in Gujrat is processed and manufactured into *bidis* in Nagpur. North Bihar specialises in chewing tobaccos. Cheroot and cigar tobaccos are chiefly cultivated in Trichinapally, Madura and Coimbatore districts. Though soil type and environmental factors are important, it is principally the art of raising special types which limits the cultivation of the chosen types of tobaccos in different parts of India.

Nursery : The seed nursery, in a raised bed, 10 × 15 ft., having good drainage, is grown for an acre of tobacco crop. The bed is manured at the rate of 15 tons per acre. This keeps the bed warm and moist and forces the plants to quick growth. An oz. of seed contains 3½ to 4 lakh seeds. Therefore, about ⅙ oz. of seed is mixed with ashes and spread over the whole bed. It is advisable to rub the seeds in the palm of hand with a little kerosene oil to prevent its being carried away by ants. The seed is covered with a thin layer of wood ashes, sand or powdered earth, and pressed with the hand to compact the surface. The nursery is kept watered just sufficient to wet the bed. The plants after germination are protected from hot dry wind and hot sun. The seedlings are ready for transplanting when they are about 5-6 inches high, after about 5 weeks. For growing local types, such as '*culcuttia*' or '*purbi*' a much greater number of plants are required and, therefore, the nursery is raised in six to seven beds.

Tobacco soils and preparatory tillage : Well-drained lands possessing granular structure are most suited to tobacco culture. By repeated harrowings with *bhakar* or cultivations with *desi* plough, the land is prepared into a fine firm seed bed. All ploughings are followed by plankings to break the clods. The field must be in perfect level, otherwise, stagnation of water spoils the uniformity of the crop. The manure applied as basal dressing is thoroughly incorporated in the soil. Field when ready for transplanting is sufficiently moist to receive the seedlings.

Manuring ; Incorporation of organic matter in the tobacco field is most essential. Every farmer applies manure according to his means. In some tracts, penning of sheep for a couple of nights is the common practice. As many as 250-300 sheep are penned at a time. Even then sufficient organic matter must be added to open up heavy soils and to bind silty soils. For raising a good crop of tobacco 8 to 10 tons is the minimum requirement. A 20 tons' dressing is advisable. The residual effect is utilised by the succeeding maize, *jowar* or *bajri* crop. When tobacco is transplanted in January-February, a green manure crop of sannhemp raised in the preceding monsoon adds about 10 tons of green matter and about 80-100 lb. of nitrogen.

To invigorate the crop a top-dressing of concentrated nitrogenous manure is applied to the crop. This either consists of 10 md. of castor cake, 2½ md. of ammonium sulphate or a half-and-half mixture of the two. Ammonium sulphate is dibbled in between the plants in the same row, or by drilling between the rows of the plants. The top-dressing is applied 5-6 weeks after transplanting. The nitrogen is rapidly absorbed and proves beneficial in increasing the size of leaves. Since rank leaf growth in Virginia cigarette tobacco is to

be avoided, the crop is not top-dressed with nitrogenous manures.

Transplanting : The seedlings are dug out of the nursery without injuring the roots. For large leaved types such as cigarette, cigar, and cheroot varieties, seedlings are transplanted, in northern India, in rows 2 ft. apart, the plant to plant distance being the same. In southern India the distance between the rows is 3 ft. and between the plants it varies from 2 to 3 ft. In small-leaved local types the distance allowed varies from 12 to 15 inches between the rows and 9 inches between the plants. Even in these types, better development of plants takes place when the distance in the rows is 1½ ft., and between plants, one foot. The number of seedlings raised for the former types varies from 11,000 to 12,000 and for the latter types from 45,000 to 60,000 seedlings per acre. Wide uniform spacing for cultivation with a hand hoe or bullock drawn implements reduces the cost of hoeing and weeding. The spot for fixing the seedling is worked with a *khurpi* and in a wide mouthed hole the seedling is pegged in the soil and patted on all sides with the *khurpi* to set it firmly. At transplanting, the seedling is carefully watered to moisten the earth 3-4 inches around the seedling. Weak seedlings are discarded at transplanting.

In southern India, irrigated tobacco is raised on furrows 3 ft. apart. The seedlings are transplanted on ridges, after heavy irrigation, at equal distances ranging from 18 to 24 inches from plant to plant. As far as practicable the rows of plants should be laid out from north to south to enable the plants to fully utilize sunlight.

Watering of plants : For about a week, unless the soil is very moist, the transplanted seedlings are watered daily by hand or with a sprinkler. By then the plants are able to establish themselves. Thereafter, the field is irrigated. In north Bihar and some parts of southern India soils maintain a high moisture status and the tobacco crop does not need irrigation. In other tracts the crop is irrigated usually at 10 days to a fortnight's interval until ready for harvesting and curing.

Intercultivation : For full development of tobacco leaves the soil aeration and high moisture content are the pre-requisites. Crust is broken after every irrigation, ordinarily by hand hoeing. The hoe is run both ways, vertically and horizontally, between the rows of plants. Hand hoeing around the plants is regularly practised until the plants are fully developed. When tobacco is transplanted in rows 3 ft. apart shallow intercultivation is carried out by bullock drawn horse hoe or other intercultivation implements.

Priming, topping and suckering : 'Priming' or the removal of the lower or primary leaves, which often touch the surface and become torn and sandy, is carried out as soon as the plants have given out fresh leaves, approximately after a fortnight of transplanting. This stripping of bottom few leaves is mostly done in cigarette, cigar and cheroot tobaccos to a height from 4 to 6 inches from the ground.

Except in cigarette tobacco, in which a tough, thin leaf, light in body is required, in other tobaccos 'topping' or removal of flower stalk, is frequently practised and is an essential operation. The top after nipping off is pierced with a hot needle. The number of leaves at the time of topping varies from 10 to 16 depending upon the type grown. If topped very high the upper leaves remain small and result in low grade tobacco.

After topping, 'suckers' soon make their appearance. These appear in the axils of leaves, those near the top starting early sprouting than those near the bottom end. 'Suckering', i.e. the removal of these side roots is carried out vigorously, almost at weekly intervals. This aids in expansion of leaves and their puckering. Both quality and yield of leaf of *hookah*, chewing, *bidi*, and cheroot tobacco types improve. Some selected plants are left untopped for seed. Thrifty and large leaved plants are selected. These are allowed to flower and set seed freely and they continue to stand in the field till the seed pods turn blackish in colour, when the seed in the capsules is usually mature.

Rotations : It is a common practice to grow tobacco after tobacco in the same field. The other crops which commonly follow tobacco are potato, maize, *bajri* or vegetable crops. Some of the commonest rotations are as under :—

Bihar and Uttar Pradesh	Tobacco-Maize-Potato
Bombay (Satara)	Tobacco-*jowar*-Fallow or cotton
Gujrat	Tobacco-*bajri*+*arhar*-Fallow or Cotton
Madhya Pradesh	(*i*) Tobacco—½ Bajra +½ Pulses-Ground nut
	(*ii*) Tobacco-Cotton-Groundnut
Madras	(*i*) Tobacco-Rice-*Ragi* or *Gingelly*
	(*ii*) Tobacco-*jola*-*Gingelly*
	(*iii*) Tobacco-Tobacco-Chillies-*jola*.
Mysore	(*i*) Tobacco-*ragi* or *jola*-horse-gram
	(*ii*) Tobacco-Horse-gram+*niger-ragi*

In some parts of Mysore, two crops of tobacco are raised per year with heavy manuring under irrigation.

Varieties : There are five classes of tobacco cultivated in India, namely, (1) *hookah*, (2) chewing or snuff, (3) *bidi*, (4) cigarette, (5) cigar and cheroot types.

The local *hookah* types consist of *calcuttia*, *gobbi*, *motihari*, *purbi*, etc. The Indian Agricultural Research Institute has been recommending N. P. 18 in the past. Recent experiments have shown that hybrids S. 19 and S. 20 surpass N. P. 18. These yielded, at Delhi, on the average over three years, 21.7 and 19.4 md. as against 14.3 md. of N. P. 18 leaf tobacco. Their cultivation

(Contd. on page 28)

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IN the Japanese method of growing paddy you must:—

A. Grow stronger seedlings for transplanting.

B. Grow a better main crop.

The first part must be done right or the second part will suffer.

The second part must be done right or grain yields will be no more than you now produce.

If both are done right your yields can be doubled or tripled!

GROWING SEEDLINGS BY THE "JAPANESE METHOD"

1. *Plan for fewer seedlings per acre:* Most farmers in India sow too many seeds. The amount sown depends in part on custom. A farmer today will plant his seed as his father did before him. But by this new method he can save seed which means, he can save money. Many good farmers plant only 20 pounds of seed for each acre to be put in paddy. Amount of seed sown will be different for different parts of India. Ask your local agricultural officer how much seed to sow on your land.

2. *Make a raised seedbed:* You should plough paddy land right after the harvest. If ploughing is not done after harvest, the land should be dug up and clods broken.

Your nursery seedbed should be four feet wide and three inches above the level of the ground. A space one foot wide should be left between the beds. This allows you to work and weed the seedbed without injuring the plants.

For each acre you plant in paddy, 1/20th of an acre must be sown for seedlings.

You sow 20 pounds of paddy seed for each acre planted to the crop. This many pounds of seed should be sown in a seedbed of 1/20th of an acre. The seedlings grown in this area will be enough to plant 1 acre of land in paddy.

Stir into the soil one basket (30 pounds) of compost or cowdung manure for each eight feet of bed.

For each eight feet of bed sprinkle a double handful ($\frac{1}{2}$ pound) manure mixture. This mixture is made of equal parts of superphosphate and ammonium sulphate.

Smooth the soil, and then cover it with fine compost manure about 1/8th inch thick. Then cover the bed with a thin layer of ashes.

The bed is ready for the seed.

3. *Selecting good seed:* Get the best seed. Ask your agricultural officer what seed you should use. Put these seeds into a bucket of salt water. The poor seeds will come to the top. Skim these off and save only the heavy seeds in the bottom of the bucket for planting.

After the seeds have been selected place them into Perenox mixed with water. Leave them in this mixture for 20 minutes.

4. *Planting the seed in the Nursery:* Two or three days before the rains, plant the seed.

Cover the seed with 1/8th inch of fine earth.

If rains do not come on time, water the bed by water cans.

Where there is canal and tank irrigation, this is not done and planting may be earlier.

5. *Caring for the seedlings:* Seven or eight days after your

seedlings come up, go through the beds and carefully remove all weeds. This is important and must be done. If proper amount of water is given, and weeding done, strong seedlings will be ready early. Your seedlings will be ready to transplant when the sixth leaf has formed. The plant will be 6 to 8 inches high at this time. In no case should your seedlings be left in the bed after they are ready. Late transplanting lowers yields. It is better to transplant early than late.

GROWING THE PADDY CROP BY THE "JAPANESE METHOD"

1. *Preparing the field* : You should plough your paddy fields right after the harvest. Following the first monsoon rains the field should be ploughed again. Your yields will be higher if a green manure crop is grown for turning under before transplanting.

Be sure to fill all cracks in the bunds. Pack these well to stop rats and crabs.

To get more out of the land, you have to put more in. Manure must be used to get larger yields. Fifteen to twenty cartloads of compost or cowdung manure is needed for each acre. This manure should be ploughed into the land before puddling. One hundred pounds of ammonium sulphate mixed with 100 pounds of superphosphate (or bonemeal) may be used on each acre, but local officers should be asked about this.

2. *Transplanting seedlings :* The Japanese treat each seedling as a baby. They pull them out one at a time and are careful not to bruise the stem or break the roots. If the soil they are pulled from is hard, it must be broken with some tool so that the roots can be saved. You should not jerk or hammer plants to remove soil.

When pulling up the seedlings, weeds must be removed. Weeds transplanted in the fields grow faster than rice and lower the yields of grain.

The Japanese have shown that planting 15 to 20 seedlings to a hill is a waste. Four is the most that should be planted. In Bombay where the method is yielding twice as much as the local method, farmers using the Japanese method never plant more than four seedlings to the hole.

By this method the seedlings are planted straight up rather than at an angle. You hold your fingers along the side of the plants and push them into the soil ahead of the seedlings. This way your fingers make way for the tender roots. The more roots you save the stronger your plants will be.

Your plants should be set in 10 inches squares. This is done by planting them in straight lines 10 inches apart in the line. There is 10 inches between each line.

To speed up planting have two workers hold a long string in a straight line, and on this string put markers 10 inches apart. The seedlings are placed in the soil at the markers. Then the string is moved over 10 inches and the planting at the markers is done again.

3. *Caring for the crop :* No weeds should be allowed to grow in the crop. After the crop has grown for two weeks the farmer must go through and remove all foreign growth. To get the highest yield, you may use 100 pounds of ammonium sulphate mixed with 100 pounds of superphosphate one month after transplanting (get local recommendations). You should work this manure into the soil around the roots of the plant. Working around the roots increases yields.

From time to time you should move a soil scratching tool between the plants. About two weeks before flowering, field work should stop. Any more cultivation will lower yields.

CAN BE CONTROLLED

By **HEALTH EDUCATION SECTION**, Ministry of Health

DO YOU KNOW THAT MALARIA IS ONE OF THE GREATEST KILLERS IN INDIA?

DO you know that in our country one in every four persons or at least 10 crores of men, women and children fall ill with malaria every year? At least *10 lakhs die each year.* Do you know that about 10 lakhs when attacked by some other disease soon after an attack of malaria either die or become an easy prey to Tuberculosis?

Malaria makes you so weak that you cannot attend to your work for months and the reduction in everybody's earning power when totalled up amounts to a loss of about 100 crores of rupees.

THIS LOSS IS NEEDLESS

We definitely know that malaria is a preventable disease. Certain simple procedures have brought almost hundred per cent control of malaria in certain highly endemic areas of Terai forests in U. P., Jeypore hills in Orissa and Ernad and Malnad areas in North and South Kanara districts of Bombay, Mysore and Madras. The cost of prevention is almost negligible when compared with the cost of treatment of malaria.

HOW MALARIA STARTS

Malaria is caused by a *germ called the malaria parasite.* It is transmitted from man to man through the agency of certain species of mosquitoes called anopheline. The female anopheline mosquito bites a person suffering from malaria or who had malaria previously and thus becomes infected. When an infected mosquito bites a healthy human being, it injects malaria parasites into his blood stream. These parasites circulate in the blood of human beings, feed on the red cells and multiply. Due to the growth and multiplication of the parasites, certain poisonous substances are liberated in the blood stream. This induces colds, chills and fever at regular intervals of one, two or three days. The fever may subside after a few hours with profuse perspiration. The individual feels very weak.

You do not get malaria by eating something or staying in foul smelling area. Nor can you get malaria by the bite of any insect or mosquito other than an anopheline. Even the anopheline mosquito must be

of female sex and must have in its body mature parasites of malaria at the time it bites a person. The sputum or the perspiration or contact with patient's skin or the clothes worn by him cannot transmit infection of malaria to a healthy person.

HOW TO RECOGNIZE AN ATTACK OF MALARIA

Intermittent fever accompanied by chills gives an indication of malaria. But certain diagnosis can be made only when the malaria parasites are seen in the blood. Let a doctor examine a tiny drop of blood under the microscope. Chronic cases of malaria have enlargement of the spleen which also gives some indication to the doctor. Once malaria is established, it can be controlled by various specific drugs like quinine, mepacrine, camoquin, plasmoquin, paludrine, chloroquin, etc., but let the doctor decide about the treatment. At the hand of a qualified doctor these drugs give best results without harmful after-effects.

HABITS OF ANOPHELINE MOSQUITOES

These are the characteristics of anopheline mosquito. Adult anopheline mosquito differs in many respects from other mosquitoes.

1. Anopheline mosquito looks as if it is standing on its head with its feet up, while biting. It's wings have pale spots.

2. It is only the female mosquito which bites human beings ; the male lives on vegetation.

3. It lays its eggs in fresh water like ponds, tanks, river beds over-grown with vegetation and avoids dirty water.

4. The young one of the mosquito known as larva hides in vegetation floating on the surface of water and rests parallel to the water surface.

5. Anopheline mosquito, as a rule, does not fly for more than one mile from its breeding place.

6. It hides in dark corners during the day time and bites when it gets dark.

PREVENTION

Thorough knowledge of the habits of anopheline mosquitoes is required to plan preventive measures. Effective control consists in treating the breeding places of mosquitoes.

As already stated, anopheline mosquito lays eggs in water. If mosquito larvæ are found in water, they can *be killed by spraying kerosine oil,* burnt crude oil or D.D.T., B.H.C., etc. on the water surface. It is not always possible to economically treat all breeding places, particularly in villages.

A lot can be done to prevent mosquitoes biting human beings. *At dusk put on clothes covering as much* of the body surface as possible. Great deal of protection is afforded by *using mosquito nets* while sleeping. All these methods help a great deal but do not effectively control malaria.

The most modern and effective method of controlling malaria consists of attack on adult mosquitoes. It consists of spraying watery suspension or emulsion containing certain percentage of *D.D.T. or B.H.C. on walls, doors, windows and ceilings* of houses where mosquitoes rest. Tiny crystals of D.D.T. or B.H.C. stick to the surface for 6 weeks to 3 months. These crystals act as a deadly poison to the mosquitoes and other insect pests coming in contact with them.

All health departments are having a large scale anti-malaria campaign with this method. You should cooperate with them by keeping your houses ready for the spray. Please remember to cover your eatables and drinking water when D.D.T. or B.H.C. is being sprayed.

Editor's Note : A simplified version of this information is available for mass distribution. Write Extension Information Officer, I. C. A. R., New Delhi--2.

★

by alkali, water or lime treatment

By

N. D. KEHAR, Animal Nutrition Division,
Indian Veterinary Research Institute, Izatnagar

N agriculturally advanced countries of the world, cereal straws constitute only a small portion of the daily ration of livestock. In India, however, the cereal straws occupy a special position as even under normal conditions these straws provide about 50 per cent of the available roughage for animals. Cereal straws are poor in protein, calcium and phosphorus. Consequently, the energy supplied by them is also of a low order.

Attempts have been made from time to time to improve the feeding value of the straws by chemical and other methods. Since cereal straws are high in fibre, advantage is taken of the susceptibility of fibre to the action of dilute alkalies.

Water-washing of straw

PRELIMINARY STUDIES

Exploratory experiments showed that when paddy straw was treated with a dilute solution of caustic soda, 70 to 80 per cent of potassium oxalate which interferes with calcium assimilation was removed. The treated straw effected better utilization of calcium and protein from the ration and increased the digestibility of total carbohydrates from 51 to 72 in wheat straw and from 57 to 76 in paddy straw, with the result that the total digestible nutrients in the straws were enhanced by about 45 per cent.

Further experiments have shown that the feeding value of paddy straw may also be improved by treatment with lime or merely by soaking in water.

The encouraging findings described above prompted us to study by simple feeding experiments, the practicability of using extensively alkali treated wheat and paddy straws in the ration of cattle in *goshalas*, *pinjrapoles* and private farms in typical paddy and wheat areas on young stock and milch animals.

ALKALI TREATMENT OF STRAW

The alkali treatment of straw consists in soaking chaffed (3-6 inches) straw for 24 hours in 8 times its weight of 1 per cent caustic soda solution.

The treatment is carried out in tanks (7ft. × 3 ft. × 2 ft.) made of cement concrete. The tanks may preferably be constructed in pairs, one placed at a higher level than the other, and in between the two, a sloping ramp may be provided. The advantage in the construction of paired tanks is that it will help in effecting economy in caustic soda

because the spent liquor of one treatment can be used again for the second treatment. The provision of the ramp has proved useful in draining out the liquor.

After the straw is kept soaked for 24 hours, it is pushed to one side of the tank and the accumulated liquor in the other corner is run out through the tap in the tank below. The treated straw is then thoroughly washed with fresh water to remove the excess alkali adhering to it. The washing may be done at least three times. The wash water is run out from the other tap.

After the final washing, the wet straw is lifted up on the ramp and taken out for drying. To treat the second instalment in the lower tank, requisite quantity of water is added into the mother liquor received from the first treatment. Half the quantity of caustic soda required in the first treatment is added to the liquor to bring it to the correct strength. After the second treatment, the liquor is thrown away.

QUANTITY OF WATER AND ALKALI

In actual practice, for treatment of two maunds of straw at a time, the upper of the paired tanks is filled to about 2/5th of its capacity with water and 10 lb. of caustic soda is dissolved in it. Two maunds of chopped straw is steeped in and a suitable weight kept on top to keep it immersed in the solution. Next morning the liquor from the upper tank is allowed to run to the lower one. Sufficient water is added to fill the tank to 2/5th of its volume and the required strength made up by the addition of 5 lb. of caustic soda. and a new lot of paddy straw is put into it.

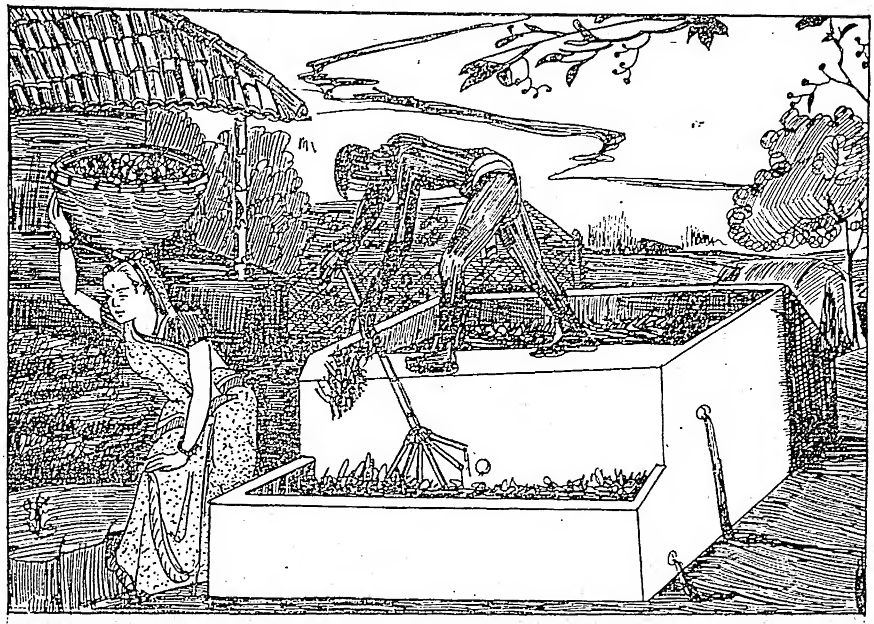
FEEDING EXPERIMENTS ON CALVES

The feeding trials extending over 22-27 weeks were carried out in the paddy straw area at the *pinjrapole* at Sodepur (Bengal) and *goshala* at Puri (Orissa) and in the wheat straw area in Sir Datar Singh's Dairy Farm at Montgomery (Punjab) and Govin Brothers Diary Farm at Rampur (U.P.). The alkali treated straw was generally better relished and showed better results.

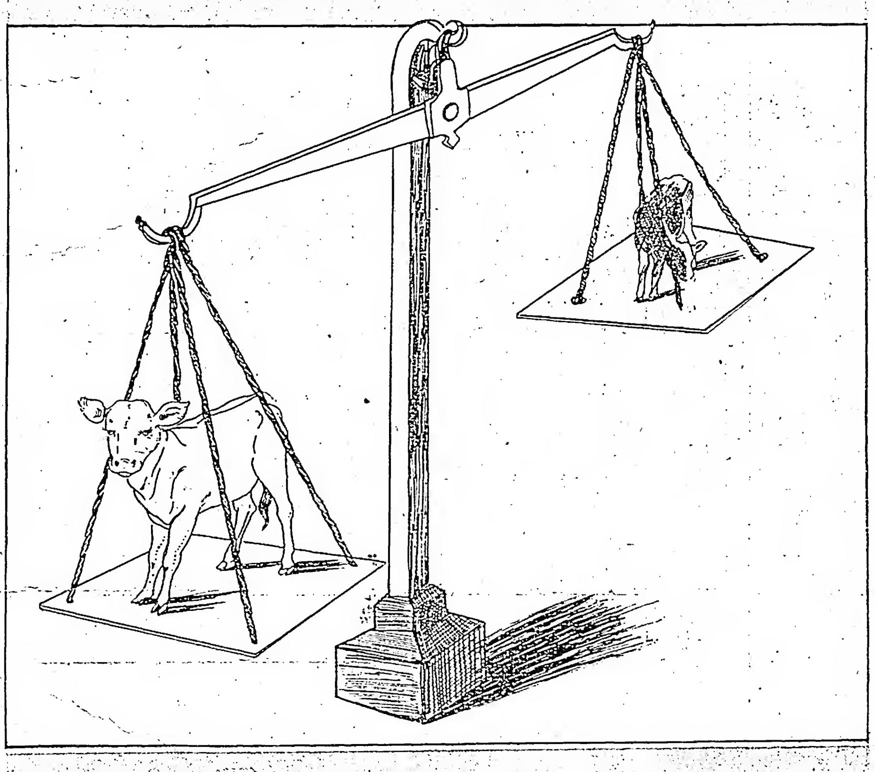
PADDY STRAW CENTRES

At Puri, the growth of calves was found to be 77 per cent higher in the treated paddy straw group as

(*Contd. on page 22*)



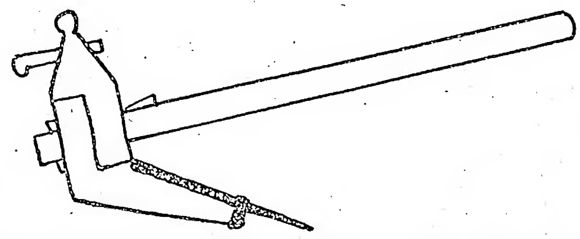
Alkali treatment tanks



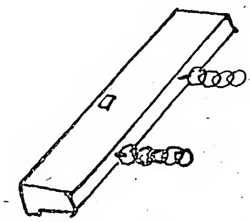
Left—Calf fed on treated paddy straw

Right—Calf fed on untreated paddy straw

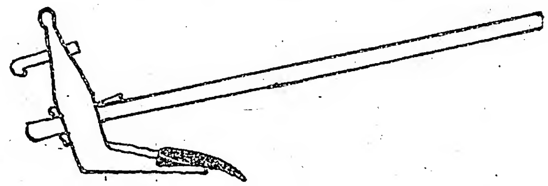
SURVEY OF INDIGENOUS AGR



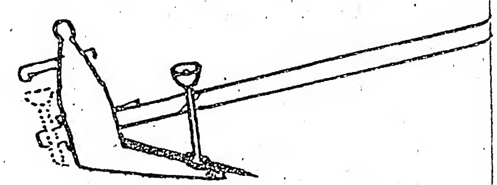
A HEAVY DECCEN PLOUGH



LEVELLING PLANK



LIGHT U. P. PLOUGH



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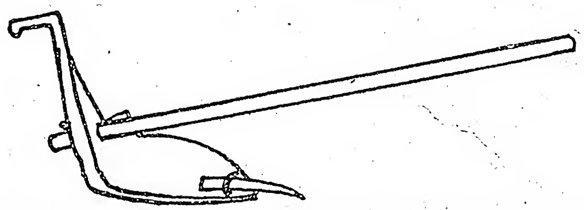
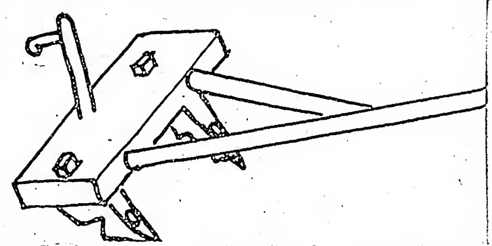


ORISSA PLOUGH FOR PUDDLING RICE FIELDS



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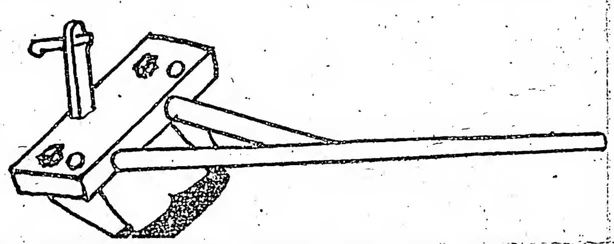
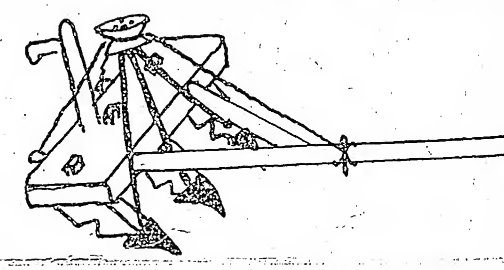


BAKHAR, GUNTAKA OR BLADED HARROW



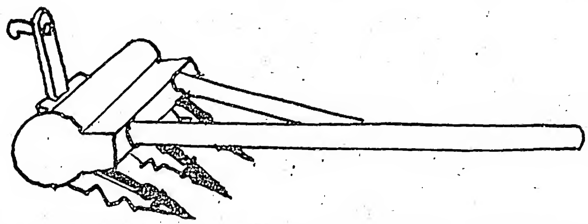
TUSARI OR LIGHT TIFAN FOR SOWING KHARIF CROPS

By **D. N. KHERDEKAR,** Mechanic…eer

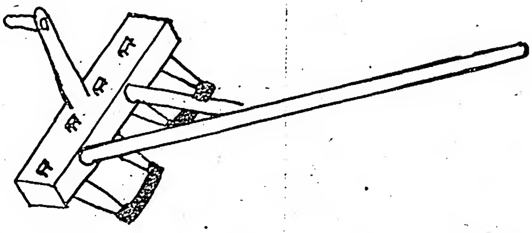
THE improvement of indigenous implements is drawing increasing attention. The problem is important because it affects the majority of Indian farmers whose farms are very small and whose purchasing power is low. As in other branches of agriculture, before proceeding to make improvements in the indigenous implements it is necessary to make an India-wide survey of the indigenous implements that exist. Such a survey can give us the idea of what the farmers have and what they need.

There are two schools of thought current in India to day. One thinks that no improvement is possible in indigenous implements and that the implements are perfectly well designed. The other thinks that the implements are all crude, inefficient and should be discarded at

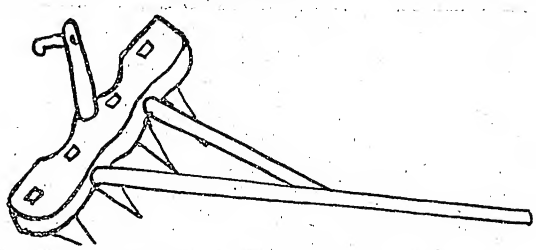
LTURAL IMPLEMENTS OF INDIA



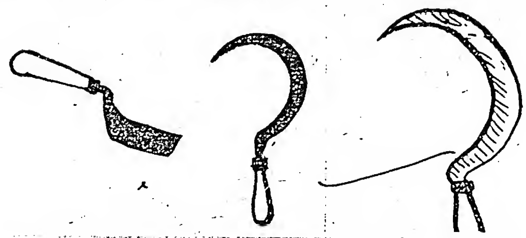
KATHANI OR HEAVY TIFAN FOR SOWING RABI CROPS



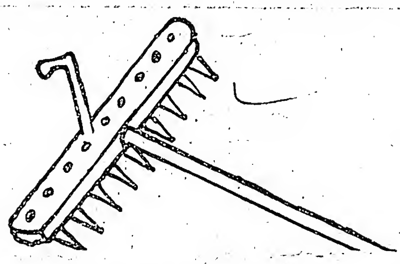
A DULARI OR TWIN DOURAS



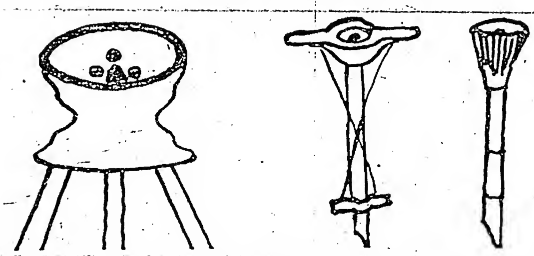
ARGADA FOR SOWING GROUND-NUT ETC.
(may be four, five or six tyned)



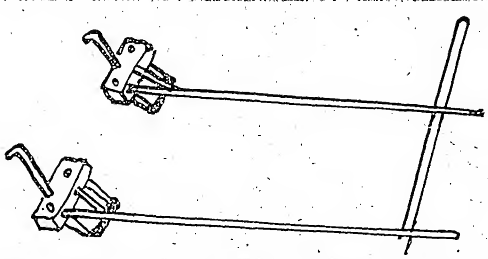
KHURPI AND SICKLES



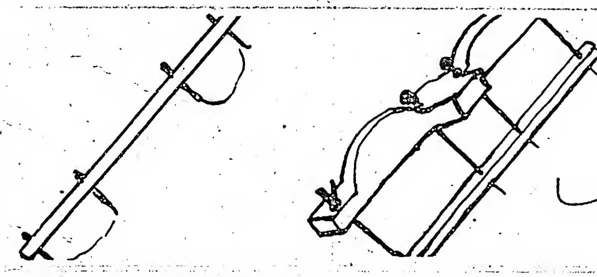
DATARI OR TOOTH HARROW FOR PADDY FIELDS



CHADA FOR TIFAN AND SARTAS OR TUBES FOR ARGADAS



A PAIR OF DOURAS OR HOES FOR INTER-CULTIVATION BETWEEN THE ROWS OF PLANTS



A LONG YOKE FOR A PAIR OF DOURAS AND A NAGPURI YOKE

(Extension), I. A. R. I., New Delhi

the first opportunity. The author thinks that both these views are extremist and that there is a reasonable 'golden mean' between these two. If we examine these implements broad-mindedly and see their working in the field with unbiased mind, we will find that some of these implements are very good for the purpose for which they are used. These implements are in use for many centuries and the experience obtained by our forefathers should not be wantonly wasted, unless it is proved by field experiments that the implement is useless. So also we should not stick to 'desi' implements only because they are 'desi.' Our patriotic sentiments should not come in the way of condemning the 'desi' or a country implement, after the scientific experiments have proved that the implement is in-

(*Contd. on page 23*)

By **K. K. IYA** and **H. LAXMINARAYANA**

THE economic potential of *dahi* and its nutritional significance to the people of India are undoubtedly of a very great magnitude, but it must be realized that due to the production of *dahi* of inferior quality both these aspects have suffered seriously. Apart from being unpalatable a poor quality *dahi* is neither profitable to the producers nor is it sufficiently nutritious to the consumers. The quality of butter or *ghee* made from such *dahi* is also poor. It is, therefore, in the interests of the individual producers, the dairy industry as well as the consuming public that earnest attempts are made to improve the quality of *dahi* by adopting scientific methods in the preparation and marketing of this valuable milk product.

HOW TO MAKE GOOD 'DAHI'

Always use clean and good quality milk for making *dahi*. Stale or watery milk, milk drawn from unhealthy animals or milk which is heavily contaminated with bacteria does not give a good product.

Use either an earthen or a well-tinned metallic vessel as the container. The former gives a better flavoured product than the latter due to greater circulation of air through its pores. Generally, shallow types of vessels impart a better flavour to the product while tall and deep vessels help in getting *dahi* of a firmer texture.

The container should be thoroughly scrubbed and cleaned, rinsed with boiling water, and well-drained before use. Earthen vessels should receive particular attention in this respect so as to eliminate all dirt, milk residues or bacteria settled in their pores. This is best achieved by boiling water in them for some time.

HEAT-TREATMENT OF MILK 162°F

Heat the milk to 70°-90° C. for 5-10 minutes or bring it to a first boil. If the milk is too watery it may be kept boiling for a few minutes more. It should then be cooled to luke-warm temperature (35°-40° C.) before adding the starter because if the milk is too hot, the starter bacteria are likely to be killed. Raw milk will not set properly and it is also likely to contain many undesirable bacteria which may spoil the quality of *dahi*. There is also the risk of disease-producing bacteria being present in raw milk whose complete destruction can only be ensured by an adequate heat-treatment. Heat-treatment will also destroy most of the other organisms in milk thus preventing the occurrence of undesirable fermentations and facilitating the growth and activity of starter organisms added to the milk.

104°F.

THE STARTER

Use only fresh starter or seed material, containing suitable types of bacteria in an active condition. The starter should be added at the rate of about one teaspoonful for every pound or half a seer of milk and the contents should be thoroughly mixed. A portion of the previous day's curdled milk can be used as a starter, which is the usual practice, provided it is of a good quality. It is, however, desirable to maintain a stock culture of the seed material separately by transferring it every day into a small quantity of milk and then using a portion of it, because the common practice of taking the seed material from the entire bulk of the curd provides considerable scope for contamination and weakening of the starter culture.

For preparing any desired quality of *dahi* (sour, sweet or highly flavoured) it is suggested that standard starter cultures, containing selected types of organisms in balanced proportions should be used. Such starter cultures are prepared and maintained at the Indian Diary Research Institute and are available for distribution to the public together with necessary instructions for their use.

STORAGE OF SEEDED MILK

Cover the vessel containing the seeded milk with a clean lid and store it in a warm place (30°-37°C.) for

16--20 hours. During this time, the milk should ordinarily curdle into a homogeneous mass with a firm texture and pleasant flavour. The milk should not be disturbed if a firm coagulum is to be obtained. By keeping the seeded milk at higher temperatures (45°-50°C.) the curdling of milk may be brought about more rapidly (within 8 hours) but the resulting product will have very little flavour. The *dahi* should be utilized as soon as possible after the curd is set since prolonged storage (particularly when the temperature is high) makes the product very sour besides causing whey separation and other defects.

When the temperature is not sufficiently warm the activity of the organisms is slowed down and the milk may take a very long time to curdle. On the other hand, if the storage temperature is too high (above 50°C.) many of the organisms may be inactivated and the milk may not curdle at all. During cold weather and in places of high altitude where, the atmospheric temperature is usually low, it may become necessary to first keep the seeded milk in a warm place (e.g., near the fire place) for a few hours to allow the starter bacteria to grow and become active, before it is stored at room temperature.

OTHER HINTS

If a good starter is used and if the instructions set down in the foregoing paragraphs are carefully followed, *dahi* of uniformly good quality would be obtained. On some occasions, it is possible to increase the flavour of the product by the addition of a small quantity of citric acid or lemon juice (0.2 per cent) to the milk before adding the starter. In some parts of the country cane sugar is added to prepare sweet *dahi* and in such cases it is desirable to add sugar to the milk before it is boiled. Addition of any other extraneous material is not desirable.

When *dahi* shows gassiness, ropiness, whey separation or it gives out bad odour it indicates either defective handling of the product or the use of a contaminated or weak starter. It must be remembered that bacteria are present almost everywhere and no amount of care can be considered to be too much for preventing the undesirable types of micro-organisms from gaining entry into the milk or *dahi* and spoiling the quality of the finished product. (H. K. S.).

DHURI COMMUNITY PROJECT IN PEPSU

Considerable progress has been reported from the Dhuri Community Project Centre, PEPSU since its inauguration a few months ago. The consolidation work has been started in all the 378 villages of the area and has been successfully completed in 40 villages with the active help and cooperation of the people.

The distribution of good variety seeds of wheat such as C.591. C.518 is also being effected through the agency of village level workers. The cultivators are competing here to grow more wheat by sowing these improved seeds according to the instructions given to them.

A dispensary has also been started at Chaunda and quite a number of patients are taking advantage of this centre for treatment. The dispensary also provides maternity benefits to expectant mothers. Anti-malarial measures are also undertaken by the doctor in charge.

Twenty-six co-educational primary schools have been started in different villages. More than 1,000 boys and girls are on the rolls of these schools taking their lessons. As many as 26 adult education centres have been established, each centre having been placed under the charge of the teacher of the local primary school.

Many cooperative societies in the villages have been started, and advantage of cooperation is brought home to the rural people in the area.

CONSIDERING the long pre-bearing age and the usual low yield of the non-descript avocadoes which were hitherto grown in South India, the new introductions with their highly precocious and productive tendencies have proved to be definitely superior and promising. They deserve to be grown on extended scale in regions similiar to that of the Kallar Fruit Station. Although this fruit with its usual bland taste may not appeal to the South Indians in the first instance, the richness of the fruit containing as it does a high proportion of digestible fat, protein and ash, would undoubtedly go to meet the situation arising out of food scarcity in the country to a considerable extent. This note presents briefly an account of the performance of some introduced varieties of avocado which have shown promise and are considered suitable for cultivation in the regions suitable for the avocado.

A three-year-old Pollock tree in bearing

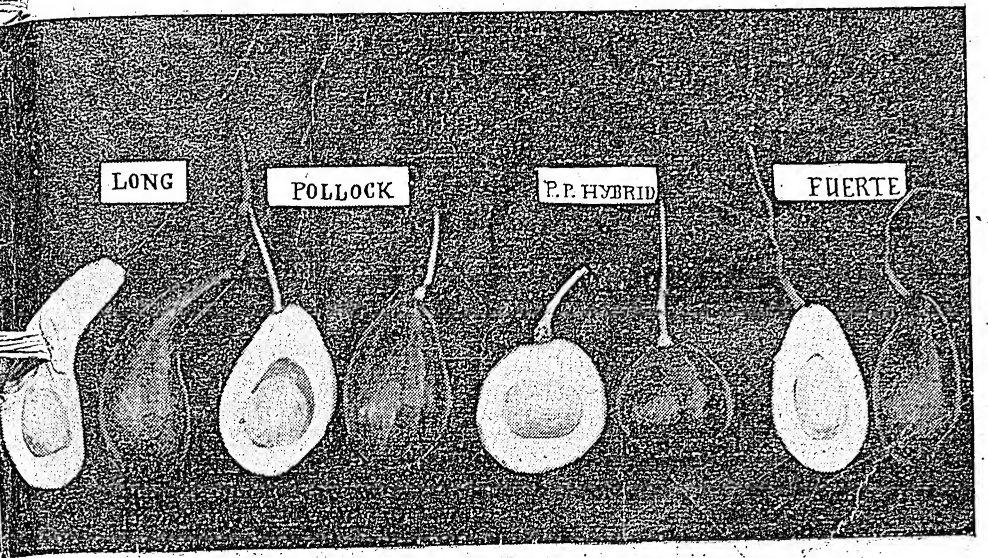
FUERTE

This variety is considered to be a natural hybrid of the Mexican and Guatemalan races of the avocado and is characterized by the anise scented leaves, which is an important feature associated with the former group. It is known to be one of the leading commercial varieties in South America. For the first time, budded plants of Fuerte were obtained from Ceylon and planted for trial at the Kallar Fruit Station in June, 1949.

During their initial orchard life the trees exhibited vigorous growth and attained a mean height of 14 ft. 8 ins. and a mean spread of 11 ft. 11 ins. in a period of roughly three years after planting. Signs of first flowering were noticed 30 months after planting in December 1951, but the flowers failed to mature a successful crop during that season. Regular flowering was recorded in February 1952 and a crop of fruits was realized in August–September 1952. The mean tree yield in the first year of bearing was 30 fruits with a range of 5 to 67 fruits per tree. The fruit size was medium to large, each fruit weighing 13 to 15 ounces, pyriform to oblong in shape with stalk inserted obliquely into a shallow cavity, apex unevenly flat and depressed around the stigmatic point. The surface of the fruit was rough or pebbled and occasionally wrinkled near the stalk end, the skin being 1/24 in. thick, of dull green colour with a number of minute yellowish dots all over, separating readily from the pulp when fully mature. The flesh of the fruit was creamy yellow in colour with a soft buttery consistency, having rich flavour and of excellent quality.

PERADENIYA PURPLE HYBRID

This variety was also introduced from Ceylon along with the Fuerte



(PERSIA GRATISSIMA MILL) FOR SOUTH INDIA

By K. FAZLULLAH KHAN & S. MUTHUSWAMI

(TOP) *Fruits of avocado varieties showing the form and pulp content*

in June 1949. As the name implies, it appears to be a possible natural hybrid, having the blood of the Mexican race as indicated by the deep purple skin colour, which is a chief fruit character of that race. The trees exhibited an equally vigorous growth as those of Fuerte and at the age of their first bearing recorded a mean tree height of 15 ft. 11 ins. and a mean tree spread of 6 ft. 7 ins. The first blossom crop was noticed in December 1951 and successive waves of blossoming were observed in January and February 1952. The fruits attained full maturity in about eight months after the first stage of flowering. Development of fruits in clusters was another conspicuous feature of this variety unlike the single fruiting habit noticed in the other introductions. The individual tree yield varied from 150 to 220 fruits and as such the variety proved to be the most prolific one out of the four introduced varieties which were under trial.

The fruit size was medium to large, each fruit weighing 14 to 16 ounces; it was roundish in shape. The surface of the fruit remained green over a major part of the maturity period tending to assume a shiny, dark purple colour towards full maturity, the skin being 1/20 in. thick, tough, brittle and readily separating from the flesh; the flesh was creamy yellow in colour, fine and absolutely fibreless with a pleasant flavour. The quality of the fruit was also good.

POLLOCK

Also introduced from Ceylon along with the two varieties described above. The budded plants of this variety were planted for trial in June 1949. The trees recorded better growth in height than in spread, the mean measurements being 15 ft. 3 ins. and 3 ft. 10 ins. respectively, at the time of first cropping. The variety belongs to the group of West Indian avocadoes and the fruits are borne on long stalks which is one of the primary characteristics of this group. The trees flowered in February, 1952 and matured fruits in September.

The fruit size was large, each fruit weighing 18 to 22 ounces, obovate to oblong in shape with the stalk obliquely inserted into a shallow cavity; the surface of the fruit was fairly smooth though often irregularly furrowed near the stalk end, the skin being 1/20 in. thick, separating easily from the flesh and tough and leathery in texture. The flesh was greenish yellow in colour, soft and buttery in texture with a rich and pleasant flavour. The quality of the fruit was also good. Considering the fruit size, this variety is superior to others, though Fuerte takes the first place in respect of the quality of fruit.

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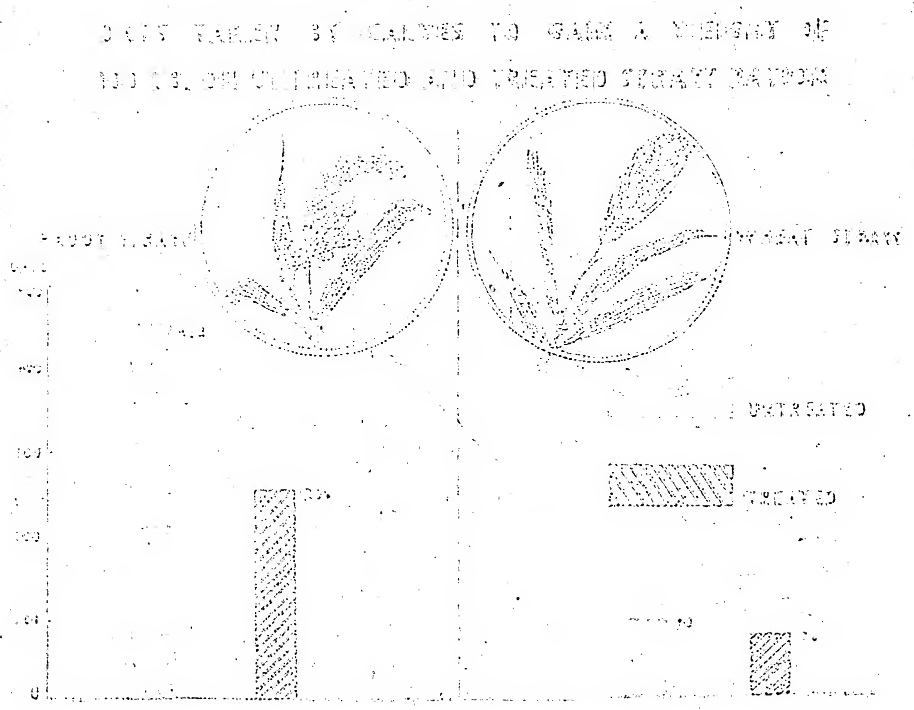


compared to the untreated straw group.

The number of days required to gain 100 lb. in weight was 452 for the untreated straw group as against 256 in the treated straw group.

At the other centre also slightly better growth was observed in the treated paddy straw group. At this centre the animals were maintained at a high plane of nutrition.

WHEAT STRAW CENTRES

The growth in the alkali treated straw group at Montgomery centre was about 19 per cent more than in the other group. The number of days required to gain 100 lb. in weight was 76 in the experimental group as against 90 days in the control.

At the Rampur centre the animals were affected with foot and mouth disease and hence no proper appraisal of the relative feeding values of the treated and untreated straws could be made.

Feeding experiments on milch animals: Investigations in regard to the effect of treated and untreated straws on milk yield showed that there was a small marginal profit on the augmented milk yield after deducting the cost of processing. If one is only to consider in terms of milk augmentation there is hardly any economic advantage. But, considering the effect of improved fodder from which the deleterious substances have been removed, and the greater utilization of protein, it may be advisable to feed milch animals with treated straw.

Places where alkali treatment of straws can be practised: The alkali treatment of straw can be undertaken with advantage only in large Government or private farms, *pinjrapoles* and *goshalas* or in villages on cooperative basis, where the number of animals is one hundred or above and plenty of water is available.

WATER TREATMENT

In places where the alkali treatment of paddy straw is not considered advantageous, water washing offers a simple and practical method by which the feeding value of paddy straw is improved and the percentage of harmful substances is considerably reduced. Water washing of straw is practicable in every home and consists of soaking the straw for 24 hours in an earthen pot after which it is washed with clean water, dried and stored.

LIME TREATMENT

In places where there is acute water scarcity it has been reported that although livestock owners soak the straw in water they do not discard the wash water. As such the harmful effects of paddy straw are not eliminated.

In such cases the addition of lime to the extent of 0.50 per cent of the wash water has been observed to reduce the harmful effects.

CONCLUSION

Summing up, it may be stated that paddy straw which suffers from certain inherent disadvantages can be improved by treatment with dilute alkali solution. This procedure is, however, applicable in places where water is available in abundance and the animals to be fed are one hundred or above.

Individual livestock owners could improve straw, though not to the same extent as with alkali treatment, by washing it with water.

In places where water is in scarcity, the harmful effects of paddy straw could be minimised by soaking it in water and the waste water could be used after adding 0.5 per cent lime.

 (*Contd. from page 17*)

efficient. The real test of the utility of an implement is that it must work economically and efficiently for a particular operation.

It is also possible to make certain improvements in the indigenous implements. We can introduce a better type of steel or can change the implements to suit the present-day cultivation methods. Most of the indigenous implements are bullock-drawn and only a few are manually operated. We will exclude bullock carts from our discussions. There are about 25 implements that have been found all over India. The description of some of the more important implements follows. Sketches are given for easy understanding.

THE "DESI" PLOUGH

The desi plough of northern tract is light wooden implement with steel share. It can plough the land to the depth of 5 to 6 inches. The heavy desi plough used in parts of the Deccan requires 3 pairs of bullocks and it can plough the land to the depth of 10 to 12 inches. It can plough about ½ to ¾ acre of land per day.

The wood used for most of this implement is Babool or Acacia wood which is very hard and strong. In various other parts of India similar ploughs differing in size and construction are used. The desi plough when used for sowing crops like wheat is called a 'Nari Plough'. In Orissa a duck-foot type of plough is used for puddling the rice fields. Because of its shape it is claimed that the operation of puddling is done in a better way by this type of plough. In a sense most of the ploughs in India act like cultivators of the modern type. The plough may cost between Rs. 15 to 25 according to its size.

BLADED HARROW

Locally called Bakhar in Bombay and Madhya Pradesh and called Guntaka in Madras, is used on the Deccan plateau. It serves the purpose of a small cultivator and a harrow to break-up the clods and to prepare the seed bed. It is a sort of cultivator with a straight or curved steel blade of about 2 to 3 feet in length. It can cultivate to the depth of 3 to 4 inches. The price of a standard Bakhar is about 20 to 25 rupees. The operation of seed bed preparation is very well done by this implement. The farmers usually do not plough the land each year and instead use this Bakhar for preparing seed beds. In addition to this it is used for sowing cotton by attaching a bamboo tube at the back through which the seed is dropped. From tillage point of view it is one of the best implements of Indian agriculture. There is some scope in it for improvement and it can be introduced in other parts of India quite profitably.

SEED DRILL

A single seed drill is called a Nari Plough as mentioned above. A two tyne seed drill is called a Dufan and a three tyne seed drill is called a Tifan and a four to six tyne seed drill is called Argada. There are two types of Tifans used for different agricultural seasons. A lighter one is called Tusari and is used for Kharif season for sowing crops like Jowar, Arhar and the like. A heavier called Kathani is used for sowing Wheat, gram, etc. There is an ingenious arrangement for distributing the seeds to the 3 tynes. A bowl is fixed over the 3 tynes to which 3 tubes are attached. The bowl is so designed that if the seed is dropped in the centre it automatically gets distributed in the 3 tubes and is led to the furrows. The groundnut is sown by means of attaching a bamboo tube behind 4 to 6 tynes Argada.

INTER-CULTIVATION IMPLEMENTS

In order to kill weeds and conserve moisture it is necessary to inter-cultivate between rows of plants. For this purpose small sized implements called Doura, Douri and Dundia are used. They are similar in construction to the Bakhars. Their blades may range from 6 to 9″ and 12″ in length. A pair of this is worked by a pair of bullocks. These are particularly useful in black cotton soil areas where cotton, groundnut and Jowar are grown. At times 3 pairs of these hoes are attached to a pair of bullocks. In some parts a multiple hoe consisting of 2 such douras is constructed and it is called a Dulari. A hand *khurpi* is also used for weeding rows of crops. A pair of harrows may cost about 10 to 15 rupees.

YOKES

In order to use bullock power to its fullest extent yokes and ropes are used for attaching the implements to the yokes. They are about 15 to 20 types of yokes used all over India. Mr. Mason Vaugh of the Allahabad Agricultural Institute few years back collected all these yokes and tested their efficiency. He has found that the yoke used in parts of Madhya Pradesh gives the best results and that type of yoke is now called a Nagpuri Yoke. In most of these implements the pull is taken by rope and not by the beam. This has an advantage because it does not hurt the neck of the draught animals. The depth of the implement is adjusted by moving the yoke forward or backward on the beam. If moved forward the implement goes deeper and if moved backward the implement goes shallower. These implements are cheap, simple in construction. All of them are manufactured by the village carpenters and blacksmiths. The village carpenter and blacksmith get their remuneration for preparation of these implements on a barter basis. The craftsmen may be paid a fixed quantity of grain per year. They will then be responsible for the maintenance as well as repairs of the implements manufactured by them. Such a village system gives more security to the farmers and it is also handy to the craftsmen because they get fixed quota of grain per year, which is unaffected by the changes in the prices.

From the above description it will be seen that if we take an India-wide view we find that Indian farmers have designed and have been using different implements for different operations. It will not be true to say that what the Indian farmers use is just 'one bent branch' in the form of a plough. Mr. Mollison stated in his text-book on Indian Agriculture "to those who are sceptical I can show in parts of Bombay presidency, cultivation by means of indigenous implements which in respect of neatness, thoroughness and profitableness cannot be excelled by the best gardeners and the best farmers in any part of the world.'

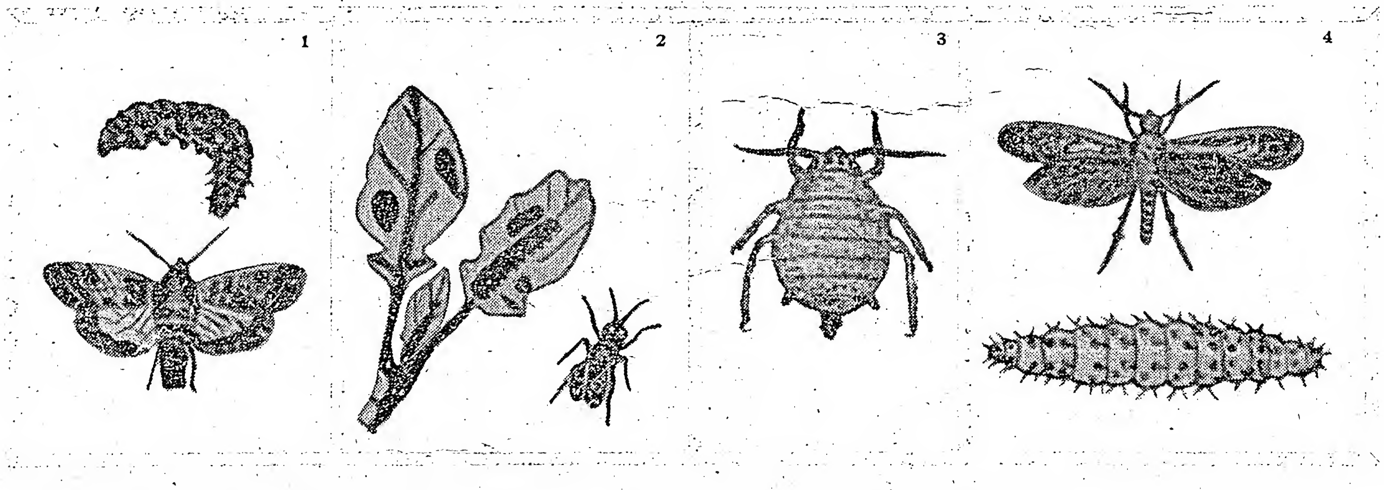
By **H. L. KULKARNY**

N the present days of food shortage, vegetables have always been an important supplementary diet of the people. Consequently, vegetable growing—whether it is in a kitchen garden or on large commercial farms—has become one of the chief agricultural industries of our farmers. The present acreage under vegetables in the Bombay State alone is in the neighbourhood of 1,00,000 acres. However, with the introduction of intensive cultivation of vegetables, the insect enemies of such crops are a great limiting factor. Being ill informed with regard to the seasonal histories of the various insects, and also failing to practice the right remedial measures, the control of insect enemies is met by the growers with varying degrees of success. It is the object of this paper to educate the cultivators in the recent methods of the control of vegetable pests in an efficient and economic manner.

APHIDS *(SIPHANO-CORYNE INDOBRASSICAE), (MYZUS PERSICAE)*

These insects are locally called *mawa* or *tila*. They are greenish yellow, minute insects measuring about one eighth to one tenth of an inch. They infest the leaves and shoots of cabbage, cauliflower, knol kohl, raddish, and mustard in the cold season. They are generally found in the field from the middle of August to the end of March. The insects are noted in 'colonies' which primarily consist of a large number of non-winged forms and a few winged insects. First incidence of the pest in the early period is marked with the appearance of winged forms which reproduce rapidly and build up the number of non-winged insects of the colony which remain fairly stationary on the host, causing most of the damage. The innumerable tiny creatures suck the sap from leaves and devitalise the attacked plants. In severe cases of infestation the leaves and shoots curl up, get yellowed and finally wither and dry up. If the infestation in the fields commences a little later, the yield of the crop is severely affected. Cloudy and humid atmospheric conditions favour the multiplication of the pest.

Control: Spraying with nicotin sulphate at the rate of 1 oz. in 10 gallons of water in which 4 oz. of soap is dissolved helps to control the pest quite effectively. Similarly, pyrethrum extract which is available in the market as Pyrocolloid when mixed with water at the rate of 1 oz. in 5 gallons of water gives good control over the pest. The insecticide dilutions are generally so recommended that they give the maximum kill percentage of the insects concerned. But it has been experienced—particularly with nicotin compounds—that the environmental factors such as temperatures greatly influence the killing power of the insecticides. At lower temperatures nicotin compounds have been noted to give lower kill of aphids. Besides, sometimes fish oil resin soap at dilutions of $\frac{1}{2}$ lb. in 4 gallons of water is also recommended for the control of vegetable aphids. Varying results are obtained in the control of aphids by the use of nicotin or fish oil resin soap compounds on account of the fact that much depends upon the methods adopted in sprayings. Larger kill of the pest is generally seen when the crops are sprayed from the lower sides of the leaves where most



(Left to right) *1. Cutworms—moth and caterpillar; 2. Mustard saw fly; 3. Aphid; 4. Diamond back moth and caterpillar*

of the aphid colonies are lodged.

MUSTARD SAW FLY *(ATHALIA PROXIMA)*

The adults are medium sized yellowish brown with blackish smoky wings and black veins. The larvæ of these insects often cause serious damage to raddish and mustard leaves by feeding on them. When full grown, they measure about 1.5 to 2.0 cm., smoky black with mandibulate mouth parts. The damage is done by biting holes in the leaves and skeletonizing them. If young plants are attacked, they are likely to be destroyed totally. The pest is noticed from July to November. Winter vegetables suffer most. The adults are weak fliers and are seen fliting about in the early morning and late in the evening.

Control: When the incidence of the pest is localised, hand picking of grubs and their destruction is advisable. The method of control is quite convenient and efficient when the cultivation is limited or when the incidence of the pest is localised. Recently, it has been found that spraying the affected crop with wettable DDT mixed with water at a rate of 1 lb. in 25 gallons of water is quite effective in the control of the pest. About two sprayings at an interval of one week are necessary. In small kitchen gardens the pest can be effectively controlled by spraying with pyrethrum extract in the form of Pyrocolloid at the rate of 1 oz. in 5 gallons of water.

DIAMOND BACK MOTH *(PLUTELLA MACULIPENNIS)*

The adult of this insect is a tiny moth with yellowish grey markings. When the moth is resting on the dorsal side, there is noticed a diamond shaped median patch on its back; hence the moth is known as diamondback moth. The caterpillar is green, measuring about $\frac{1}{3}$ inch long, with a smooth body having short bristles sparsely scattered over it. They bite holes in the leaves of all the cruciferous plants. In severe cases of attack the leaves appear rugged with innumerable holes. The pest is mostly active in the field from September to March.

Control: Spraying the affected crop with wettable 50% DDT mixed in water at a rate of 1 lb. in 30 gallons of water gives good control over the pest. If the young crop is infested, spraying with lead arsenate at a rate of 2 oz. in 4 gallons of water controls the insects. Treatment of cabbage with lead arsenate is regarded safe, as the growth of the head is from within and the leaves bearing poison can be removed when the crop is harvested.

CABBAGE CATERPILLAR *(PIERIS BRASSICAE)*

The adults are white butterflies with wing expanse of about one and three quarter inches. The caterpillar is velvety green, measuring about one and quarter inch in length. The caterpillars feed on the leaves of most of the cruciferous plants. In cases of heavy infestations, the leaves are eaten away resulting in a rugged appearance of the attacked plants. The pest is mostly active in winter and passes through a number of broods. The life cycle from egg to egg occupies about 4 to 5 weeks.

Control: When the infestation is restricted to a small area, the caterpillars can be hand picked and destroyed. Even spraying with pyrethrum extract in the form of Pyrocolloid at a rate of 1 oz. in 5 gallons of water is advisable. Cabbage may be sprayed with lead arsenate without any danger to the consumer. It is dangerous however, to use stomach poisons on the cauliflower heads and therefore are not recommended. Spraying with wettable 50% DDT powder mixed with water at a rate of 1 lb. in 20 gallons of water is recommended on a field scale.

PAINTED BUGS *(BAGRADA PICTA)*

The adult bugs are black smoky, with yellow and red markings. They measure about 5 to 7 mm. The adults and nymphs suck the plant sap from the leaves of host and devitalise them. The pest is active from October to March. The pest is so far recorded as of minor importance.

Control: In the early stages of infestation when the incidence of the pest is localised, hand picking of nymphs and their destruction helps to check the pest considerably. As the insects mostly infest the outer grown up leaves, BHC 5% dust in the form of gammexane or Hexidole when dusted on the affected crop, helps to kill the pest. In the late stages, when cobs or earheads are formed, BHC dusting may not be adopted as it is likely to impart odour to the produce.

By

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EXTENSION is a link between the farmers and the research worker. Efforts are now being made to strengthen this link considerably. The establishment of numerous Community Projects in India is an important step forward to this end. As in other branches of Agricultural Science, proper extension approach in Agricultural Engineering is also very essential. Agricultural Engineering covers a very wide field and includes in its orbit study of farm implements, machines, tractors, waterlifts, farm buildings, rural electrification, soil and water conservation machines, dairy equipment, horticultural tools, and even agricultural aircrafts. As far as the conditions in India are concerned, we have to deal more with the agricultural implements and tools. The author proposes to give in this chapter underlying principles behind extension approach in agricultural machinery, ways and means to do it effectively and some practical hints for Indian village conditions.

Any extension work must be backed by solid fruitful research. This is the prerequisite of extension. There are two ways by which this can be achieved :

(*a*) To popularize amongst the farmers the implements and machines which have already proved successful.

(*b*) To carry out original research work, test new implements, adapt foreign tools, improve indigenous implements and make these available to the farmers.

In order to make progress in the shortest time both the above lines of action must go on simultaneously.

The main feature of Indian Agriculture is that nearly 95% of the farmers for years and decades to come, will have to depend upon small implements either bullock drawn or manually operated. The mechanization in the Western sense will at the most affect only 5% of Indian farmers. Because of small nature of holdings, lack of finances, and for other similar reasons an overwhelming majority of farmers in India have to depend on small implements. It is, therefore, necessary to give correct emphasis for introducing small, simple, cheap and efficient implements. Since the establishment of the Agricultural Departments in India many efforts were made to emphasise the importance of the use of improved machinery and particularly the bullock-drawn or manually operated machinery. Some individual research workers and some leading private firms have succeeded in designing, mass manufacturing and introducing improved types of agricultural implements.

In this article we shall mainly deal with the bullock-drawn or manually driven implements.

In order to do extension work in Indian villages we must first understand the set up of the villages, psychology of the villagers, their financial limitations and social outlook. Personally the author does not believe that the majority of Indian farmers are intolerably conservative, unintelligent and that they lack agricultural knowledge. Farmers in every country are rather more conservative than the towns' people. The real reason why the farmers have not yet adopted improved implements are :

(*a*) Much remains to be done in the field of designing new implements.

(*b*) Till now there was no well organised agency for doing extension work in the villages.

The farmers in general are shrewd people; though outwardly they look simple folks. If they think that a particular machine is not useful to them, they will not express this opinion before the officers and they will try to put forth certain excuses for not purchasing it. This may be due to fear of the authorities in the villages. If, however, a machine is found to be really useful to the villagers, they themselves come forward to buy it. Take the case of Kirloskar's mould board ploughs in Black cotton areas of Berar, where thousands of these ploughs are in use. Another good example is a bullock-driven sugarcane crusher made of iron. Thousands of these are now in use in sugarcane growing tracts of U. P. and Bombay State. Hand Chaff Cutters of circular type are very popular in the Punjab. This success is due to the fact that these simple implements have proved their real worth in actual field conditions. The primary qualification of a good implement, therefore, is that it must prove a success in the locality and for the conditions for which it is designed.

Every implement for village condition in India should have the following characteristics :

(*i*) The implement should be simple in construction, so that repairs and even manufacture can be done by the village carpenters and blacksmiths with their tools.

(*ii*) It should be cheap—that is within the limit of the purchasing power of small farmers. It should not, however, be cheap at the cost of efficiency.

(*iii*) It should be significantly more effective than the implements in vogue. Their intrinsic utility must be proved by field trials, and should be demonstrable by occular demonstrations.

(*iv*) It should be worked either by animal or by man power.

Even well qualified extension workers have to learn much from the illiterate and poor farmers. Nothing

will be achieved if we go to the villages with an air of superiority to teach or to help the poor creatures. Villagers are extremely poor. We cannot simply imagine their poverty. They have to think twice even to spend one rupee. Under the extreme hardship, limited scope, adverse climatic conditions, and above all the pitiable sub-human financial conditions, majority of Indian farmers (about 70%) are doing their best and due credit should be given to them. Extension workers should respect the practical experience of the farmers and try to learn from them. It is a give-and-take matter. We can '*Serve*' them better with sympathy and good-will. This is the foundation principle of extension even as applied to Agricultural Implements.

THE PROCEDURE SUGGESTED TO POPULARIZE IMPROVED IMPLEMENTS IN THE VILLAGES

(1) Find out the requirements of the particular tract. "We have to give to the farmer what they want first". In paddy tract the farmer may require a small plough, a puddler, a bund former, a paddy sheller. In cotton tract the farmer may require a heavy plough, a cotton planter, or a hand gin. In orchard growing areas he may need a suitable water lift, a sprayer or a fruit grader. For each such tract, a list of urgently needed implements should be made.

(2) Then find out from the Agricultural Engineers or from the Machinery firms if the required types and sizes of implements are available. If they are not, then a request should be made to the agricultural engineers to devise a suitable implement for particular operation. With the help of local bodies a set of improved implements should be purchased for every group of say 10 to 20 villages and they should be tried there for at least a season. If they are found successful they should be recommended to the farmers.

(*c*) For one field operation we may find a number of suitable implements. A complete record of these along with the address of the suppliers should be kept at hand by an extension worker. He should then ask the farmer how much land he has, his crops, his financial condition and then recommend a suitable implement or he may recommend alternatives so that the farmer can choose for himself. An excellent example for this is the operation of 'winnowing', i.e., cleaning and separating grain from chaff and *bhusa* from the threshed material. This operation is usually done in the months of February-March when there is danger of hail-storms. The farmers are anxious to get the years' produce in their houses as early as possible so that there is no chance of damage due to climate or thefts which often occur on threshing floors. In villages winnowing is done by means of natural wind which often fails resulting in delay in the operation. Various machines have been devised to replace this natural wind. They cost between 30 to 600 rupees. Most of them are simple, cheap and effective. If the farmer is a big land holder having say 200 to 300 acres of land we can recommend to him the machine costing 600 rupees. If he is a medium farmer or a small farmer, he can choose less costly machine suited to his purse and crops. The table shows how to do it. There is no hard and fast rule. We have to use our judgment and examine each case separately for proper advice and recommendation. It should be remembered that for one field operation there is nothing like one

(*Contd. on page 31*)

HINTS TO THE FARMER

(*Contd. from page 9*)

in the I.A.R.I. Delhi State Intensive Cultivation Scheme area is extending rapidly. They show a high degree of puckering and have very large sized leaves. In the Punjab, T. 12 has succeeded where tobacco is cultivated under well irrigation. In Gujrat, S. 57 is recommended for irrigated tracts.

For chewing and snuff, N. P. 18 and N. P. 70 are recommended for north Bihar and Uttar Pradesh. In Bombay State, S. 57 has been given out for this purpose. In Coimbatore district, *meenampalayam* is cultivated. This tobacco is prized as the best type for the purpose in South India.

The Indian Central Tobacco Committee evolved Kelieu 49 and Pilieu 19 for the Charotar tract in the Bombay State. Recently, Surti strains S. 20-2 and S.12-5 have yielded 12 per cent higher than the other varieties. In Mysore, the three varieties grown under the descriptive names are (1) *kanigalu* (Oleander like) with long narrow leaves, (2) *anekivi* (Elephant's ear) with broad and large leaves and (3) *balepatte* (Plantain leaved) with long but medium wide leaves. Kanigalu type is usually used for *bidi* manufacture.

For cigarette, the first to be introduced by the Madras Department of Agriculture were Adcock, White Burley and Harrison's Special. The bulk of the area in

E R R A T A for the article entitled "FIBRES FROM RAM-BAN" published in the November, 1952 issue of *Indian Farming*.

page 16, top photo	*for the caption*	A thick hedge of 'Ram-ban'
	read	The fibres are neat, shining, white and strong.
page 16, photos at the bottom *left to right* first photo	*for the caption*	Poling. Note the bulbils..........the fibre
	read	A thick hedge of 'Ram-ban'
second photo	*for the caption*	First the tip is cut...................sickle.
	read	Poling. Note the bulbils on the top of the pole. From the adjoining plants leaves have been cut to extract the fibre.
third photo	*for the caption*	Fibres are extracted by the fibre extractor.
	read	First the tip is cut and then the spines along the margins of the leaf are removed by sickle.
page 17, third photo from top from top	*for the caption*	The local 'dhera'. Fibres are spun into thin string.
	read	The simple fibre extractor.
page 17, photos at the bottom (*right to left*) first photo	*for the caption*	The fibres are neat, shining, white and strong.
	read	The local 'dhera.' Fibres are spun into thin string.
second photo	*for the caption*	Leaves and the fibres.
	read	Fibres are extracted by the fibre extractor.
third photo	*for the caption*	The simple fibre extractor.
	read	Leaves and the fibres.

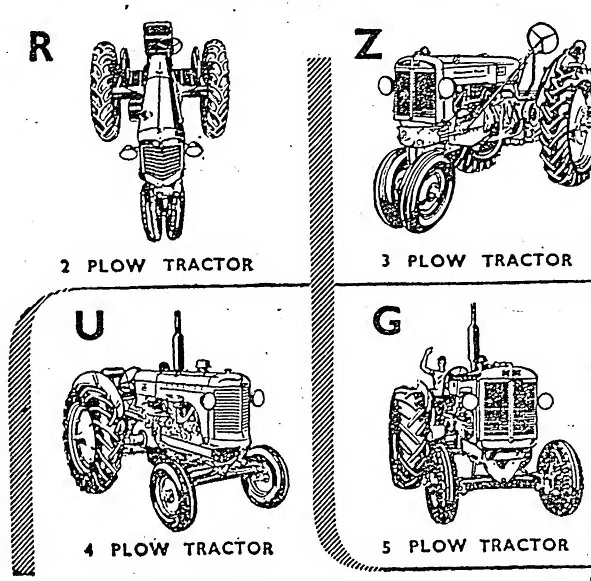
Guntur, Kistna, Rajahmundry and Godavari districts in Madras State is occupied by Harrison's Special 9. Amarelo 5, bred by the Indian Agricultural Research Institute, in 1945, is an early maturing type with leaf of good body and texture. Another flue cured variety introduced to replace Harrison's Special 9, is *challam*. It is reported to have high percentage of yellow grade, better aroma, whiter ash and very good fire holding quality. In the Punjab, type S. 57 has proved very successful. In Satara district in Bombay State, Saharanpur and Jhansi in the Uttar Pradesh and Muzaffarpur in Bihar, Harrison's Special is the chief variety cultivated.

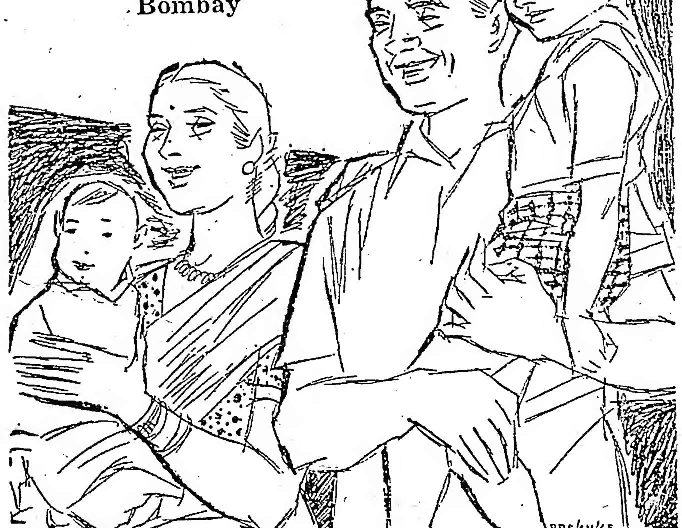
The cheroot types *monna kaphal, usi kaphal, vatta kaphal, verumai kaphal, lankas* and *chebrole* are cultivated in Trichinapally, Madura, Coimbatore and Guntur districts of Madras State. Usi kaphal is used for cigar manufacture. In Rangpur, Bengal, the varieties cultivated are Pennsylvania, Sumatra and Burmese Havana.

Harvesting and curing : The crop is harvested when the bottom leaves become yellow, their veins become swollen and leaf feels thick and gummy. The plants of *Hookah*, chewing and *bidi* tobacco types are cut and spread out in the field. The plants should be cut flush to the ground with a sharp knife, hatchet or sickle. They should be allowed to lie on the ground to wilt for an hour or two or until the leaves loose their brittleness and can safely be handled without breaking. Only cut just enough number of plants or strip leaves as can conveniently be handled every day. For curing in flue barn or on stakes the leaves are transported to the appropriate spot. The process of curing depends upon the type of tobacco grown. For cigarette, cigar and cheroot types the leaves are stripped from the plant and gathered as they mature for flue barn curing. In the sun cured types the leaves are separated from the stalks and graded for the market. Similarly, the flue cured crop is suitably graded for sale.

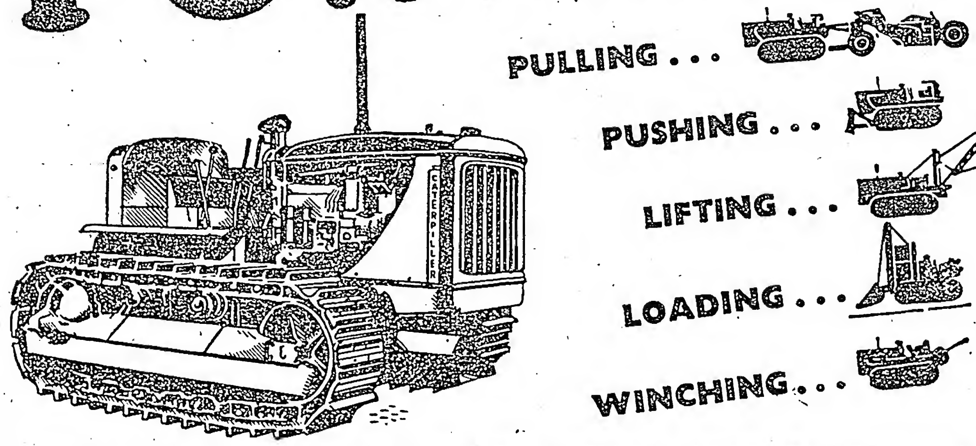
Insect pests and diseases : Some insects carry virus infection. Badly infested leaves are detached and burnt. They also suck the juice from the leaves. Spraying with rosin tobacco mixture with the onset of infestation checks the attack. Stem borer (*Phihorimoea heliopa*) attacks seedlings and young plants. The leaf eating caterpillar (*Prodenia litura*) feeds on leaves. Dusting with 5 per cent gammexane keeps both these pests off. In storage, fumigation with carbon disulphide stops infestation of brown beetle (*Lasioderma serricorne*). Spraying with Bordeaux mixture keeps leaf spot disease (*Cercospora nicotianea*) in check.

Orobanche, the parasitic weed, is often the most serious trouble for tobacco. In highly infected plots the crop can only be grown in four-years rotations. Systematic and thorough weeding at short intervals is essential.





POWER FOR



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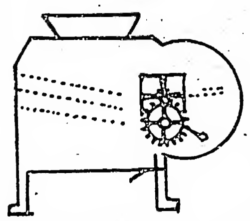
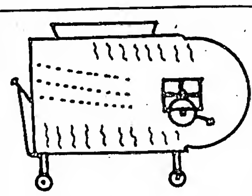
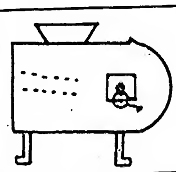
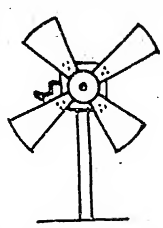
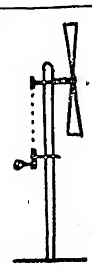
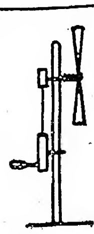
EXTENSION APPROACH IN AGRICULTURAL ENGINEERING

(*Contd. from page 27*)

implement suitable for All-India, because India is a subcontinent with enormous variations in climate, soils, crops and even in the size and strength of bullocks. We have therefore to understand needs of particular locality. It is the best way to ensure that our recommendations prove fruitful and thereby we get the *confidence* of the farming community which is our greatest asset for future extension work.

Types of winnowers	Construction	Approximate Price	Suitability	Possible Source of Supply
	All Steel	Rs. 400 to 600	For big Farmers having over 200 acres of Land	M/s. Kirloskar Ltd., Satara
	Mostly Wood	Rs. 300 to 350	"	M/s. P. S. G. Ltd. Coimbatore
	Steel (Small Size)	Rs. 150 to 175	Medium farmers having 50 to 200 acres of Land	M/s. P. S. G. Ltd. Coimbatore
	Geared Fan	Rs. 125	"	M/s. Sangam Metal Works Satara Road Poona and M/s. Cossul and Co., near Parade, Kanpur.
	Cycle chain driven Fan	Rs. 60	Small Farmers having 1 to 50 acres of land	Govt. Central Workshop, Sadar, Nagpur
	Rope Pulley driven fan	Rs. 30 to 40	"	Allahabad Agricultural Institute, Allahabad

A CORRECTION

November, 1952, issue of Indian Farming.

Page 11, Col. 1, (four lines from below) *For* 'Day by day these shows are gaining such importance that if they are not held after long intervals they shall be the best sale-display ground for high class cattle.'

Read 'Ultimately these shows initiated by the department are gaining such importance, that they at not too distant a date shall be the best sale-display ground for high class cattle of the respective breeds in the State.'

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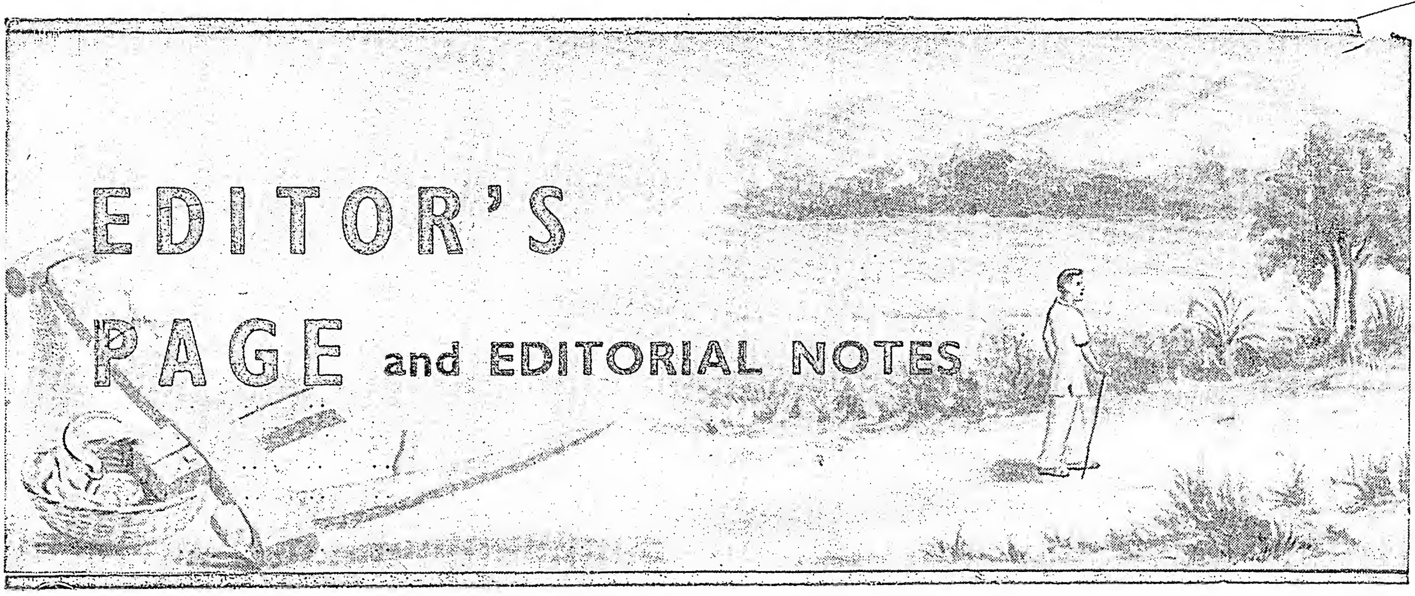


It is a happy sign of times that the problems connected with soil conservation in India are receiving increasing attention. This is as it should be, because the soil happens to be the productive capital of the country and should be well managed and conserved so as to give constant and possibly increasing returns.

The problems connected with soil conservation of India were discussed at a recent meeting of the Soil Conservation Society of India which has completed one year of existence. According to Shri V. T. Krishnamachari, Member of the Planning Commission and President of the Society, it has done useful work in its first year to study the different aspects of soil conservation.

Soil erosion, as has been pointed out by Shri V.T. Krishnamachari, is the most serious problem facing India. The problem of soil erosion is intimately connected with the denudation of forests in catchment areas of rivers. The cutting down of trees and the removal of protective vegetation cover bring about erosion and cause floods.

The ravage wrought by soil erosion is painfully apparent in many parts of India. The extension of desert areas, though slow and imperceptible, is none the less a fact claiming attention. For example the desert area of Cutch is encroaching upon the fertile parts of Gujarat and the Rajasthan desert is spreading itself into the fertile plains of the Gunga. The extension of desert area will have to be successfully tackled if the agricultural production of the country is to be increased or even maintained at the present level.

Inaugurating the Conference on Soil Conservation, Shri C. D. Deshmukh, Union Minister of Finance, stressed the fact that there was as yet a general lack of realisation in this country of the seriousness of the erosion problem and the extent of the damage it has brought in its trail. He was right, therefore, when he suggested that the first thing that was necessary in tackling the problem of erosion was the assessment of the magnitude of the problem, of the extent of areas affected by erosion in different parts of the country, the types of erosion and the degree of damage done in each. Such a survey was essential to the formulation and control of sound soil conservation programmes both at the State and Central government levels.

It must be admitted, as was pointed out by Shri C. D. Deshmukh, that while a certain amount of soil conservation work is going on at present, the extent of conservation effort is very small compared with the magnitude of the problem.

Soil erosion is intimately connected with man's use or rather misuse of land. Erosion of land and its prevention, therefore, do not merely throw up technical problems for solution; they have also social implications. Since erosion is caused by certain activities of man, its prevention necessarily means interference with and imposing restrictions on such activities. These restrictions will be accepted only if the people believe

them to be beneficent to them. It is essential, therefore, that people are educated to appreciate the restrictions imposed on the misuse of land.

* * * *

Of late there has been increasing international co-operation in the field of agriculture and veterinary science. This was evident from the setting up of the International Training Centre for Vaccine manufacture which was opened at Indian Veterinary Research Institute at Izatnagar on the 16th February, 1953. The Centre will operate under the Technical Assistance Programme of the F.A.O. in conjunction with the Government of India. Dr. S. Datta, the Director of Veterinary Research Institute, will act as Director of the Training Centre, and Mr. R. Daubney, an F.A.O. expert, will act as its Assistant Director.

Virus diseases like rinderpest, sheep-pox, etc. claim a high mortality of cattle and livestock in the Middle East and South-East Asian countries. In India alone the annual loss of livestock is estimated at over Rs. 20 crores. The work of the Training Centre is, therefore, of special interest to these countries.

The Training Centre was inaugurated by Dr. Punjabrao Deshmukh, Union Minister of Agriculture. Inaugurating the Centre, Dr. Deshmukh stressed the importance of the work of vaccine production at Indian Veterinary Research Institute.

Cheap production of large quantities of vaccine and the practical means of preserving the vaccine produced form the main feature of the training course. Both production and preservation are closely associated, for without any means of preservation production of vaccine will be useless and without production the question of preservation will not arise. The problems relating to preservation are of special interest in tropical regions, because while transporting vaccine to long distances, it is essential to ensure that the products do not deteriorate in quality and efficacy. It is hoped that as a result of the training all the participating countries will be benefited.

* * * *

(*Contd. on page 9*)

OUR COVER

Saurashtra breeds better Cattle
Its 'Gir' breed is well known

MAN OF THE MONTH

REFUGEE FARMER BECOMES A KRISHI PANDIT

Shri Walaiti Ram

By

A. R. VYAS

OF the six farmers of the Indian Union, who received the certificates of "Krishi Pandit" at the hands of the Prime Minister in January last, two hail from the same district, Ludhiana, in the Punjab. The achievements of Sardar Gurudev Singh of Kalal Majra have already appeared in the pages of "Indian Farming"; the other is 47-year old Lambardar Walaiti Ram of village Agwar Khaja in Jagraon Tehsil.

It was a cloudy winter's day last January, when accompanied by Shri Prakash Dev, the District Public Relations Officer of Ludhiana, I motored to Jagraon, which is the brithplace of another national hero, Lala Lajpat Rai. The latter fought for the country's political freedom; Walaiti Ram works in his fields, helping the country to win its battle for freedom from foreign food. His yield of 46 maunds 8 seers and 5 chataks of gram on an acre is more than nine times the Indian yield for this crop!

REFUGEE FARMER

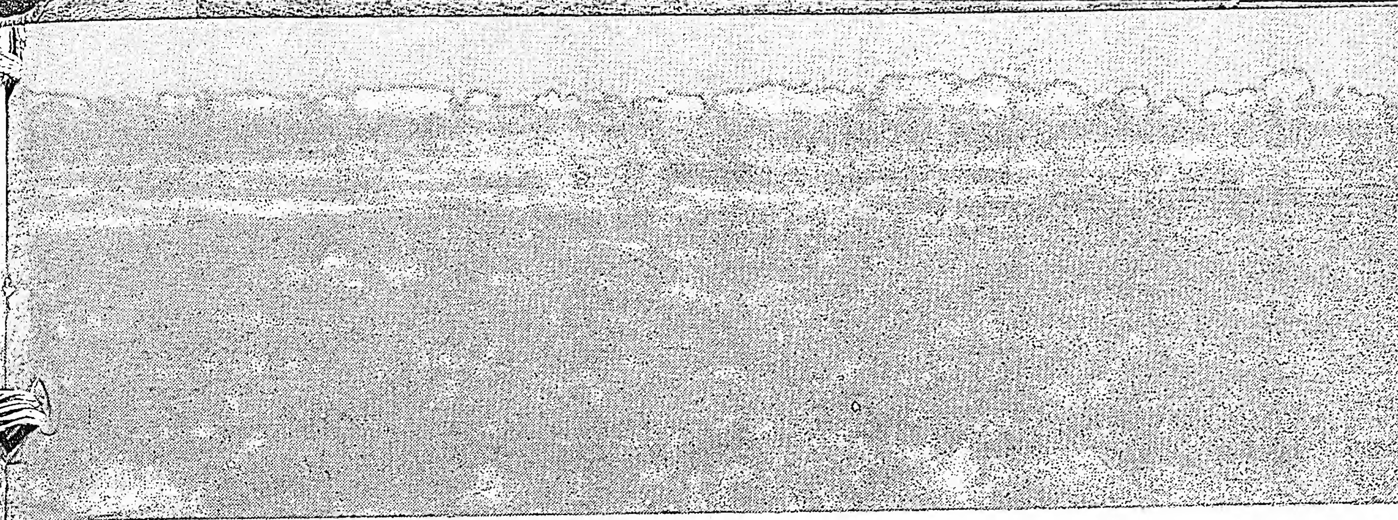
Gathered round a brazier in which the charcoal burnt only fitfully, I sat with my host, the Public Relations Officer and the local Thanedar listening to the story of Lambardar Walaiti Ram, who was a refugee from Pakistan. He had heard of my arrival, and had left his field to see me. He was keen that I should hear his tale of woe and success. In short, crisp sentences, he told me that he was a refugee from village Sitanagar in the Montgomery district of West Pakistan. He had owned 100 acres of land on which he had grown wheat and cotton for over 30 years. Came partition, and the separation from his land, every inch of which he had grown to live through the long years that he had cultivated it. "I had two children, a boy of eight and a girl five years younger" he said as he looked at us through his small, beady eyes, slightly bedimmed. "Both of them died. After that I have had no other interest in life except farming". He paused for a while. I did not want to break his thread of thought by my interruptions. I let him tell his story in his own way.

"Driven out from Montgomery" he continued: "I came to Jagraon five years ago and got a temporary allotment of *banjar* land, which I cleared and cultivated. That was taken away from me the next year, because it was classified as urban land. The same thing happened once gain. The land which I now hold was given to me in 1950".

"How large is your holding?" I asked.

"Only 30 acres" he said pathetically. "If you come with me I shall show you my neighbour's fields as well as my land. I have cleared it of useless growth and levelled it."

I suggested our going atonce. A drive of a few minutes brought us to Walaiti Ram's fields, portions of which were green with gram and wheat. A large patch, however, remained ploughed but unsown. I asked my new friend the reason for this. It was only



Walaiti Ram's fields. A portion in the front is ploughed but ungrown and awaits a winter shower. In the background the field is green with gram and wheat

when he told me that he was waiting for the rains, that I realised that all his land was *barani;* there was no source of irrigation to be seen anywhere round about. The contrast between Walaiti Ram's level fields and the undulating fields of his neighbours dotted with clumps of wild growth, was marked. I was interested in finding out what methods had been used to raise a record crop of gram on a field which was devoid of all irrigation facilities, and which till recently was *banjar* land.

METHODS EMPLOYED

I pieced together the following story of Walaiti Ram's success. His 30-acre land, which consists of light loamy soil had remained fallow during the period April to October. Used as a resting place for cattle, it had been manured for months by their urine and dung. In September the land was ploughed 7 inches deep by a tractor. A heavy wooden *sohaga* weighing about 10 maunds, was used with the tractor three or four times after each deep ploughing. This, I was told, helped to conserve moisture in the land. In the middle of October the whole area was sown under gram mixed with a little wheat and mustard. The seed rate was 20 seers an acre for gram and about 4 seers an acre for wheat.

"Was any fertilizer or manure used?" I asked.

"None beyond what the cattle gave to the land, when they used it as a resting place" Walaiti Ram replied.

"How about water for the crop?" I persisted.

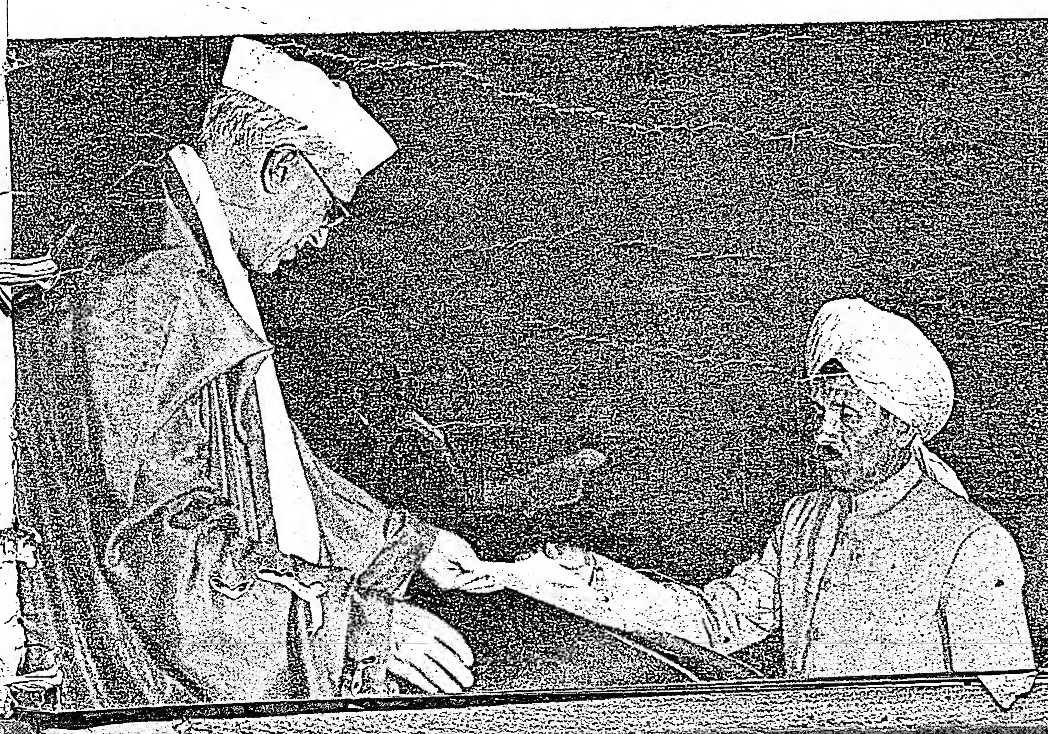
"Towards the end of November, there was a good shower of rain" said the farmer "which brought out the crop wonderfully. The growth was so rapid, that I had to prune the top four or five inches, lest there might be lodging later on."

"In the middle of January, there was another welcome shower" he continued. "After that I just waited for my crop to ripen."

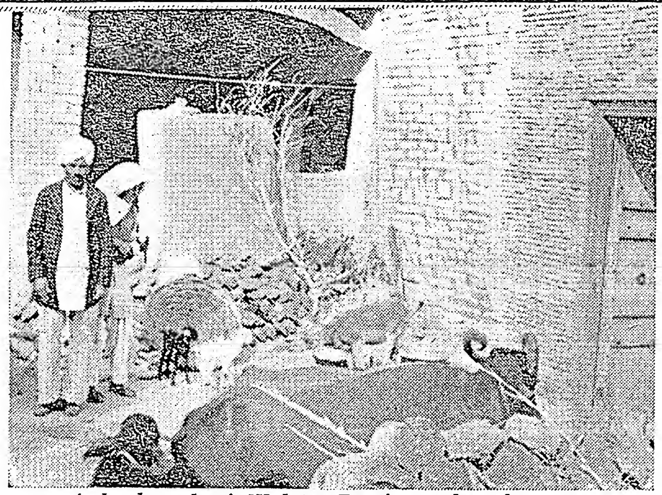
He told me that the total investment on the one acre plot entered for the competition was about Rs. 130 and the sale proceeds came to Rs. 600.

WALAITI RAM-THE MAN

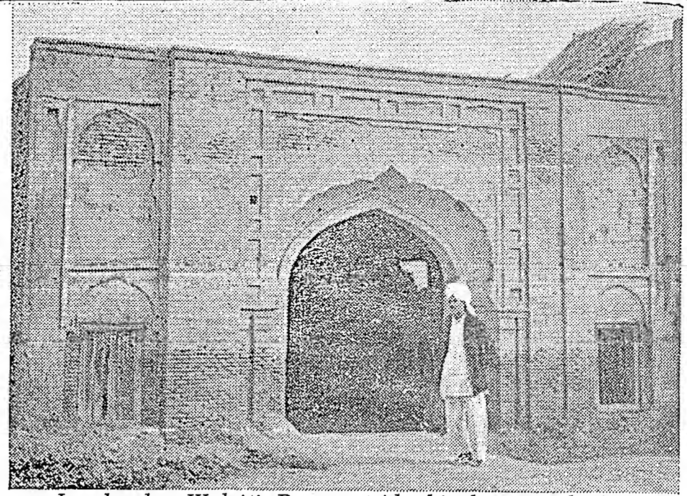
I had seen enough of the farmer Walaiti Ram, and the results of his intimate knowledge of the principles of dry farming. I wanted to see a little more of the man and, therefore, we went to his house. As we walked, Walaiti Ram talked fast—he had many grouses against the government; they had always allotted him *banjar*



Shri Walaiti Ram receiving the certificate of "KRISHI PANDIT" from the Prime Minister



A backyard of Walaiti Ram's modest house



Lambardar Walaiti Ram outside his house, which is evacuee property

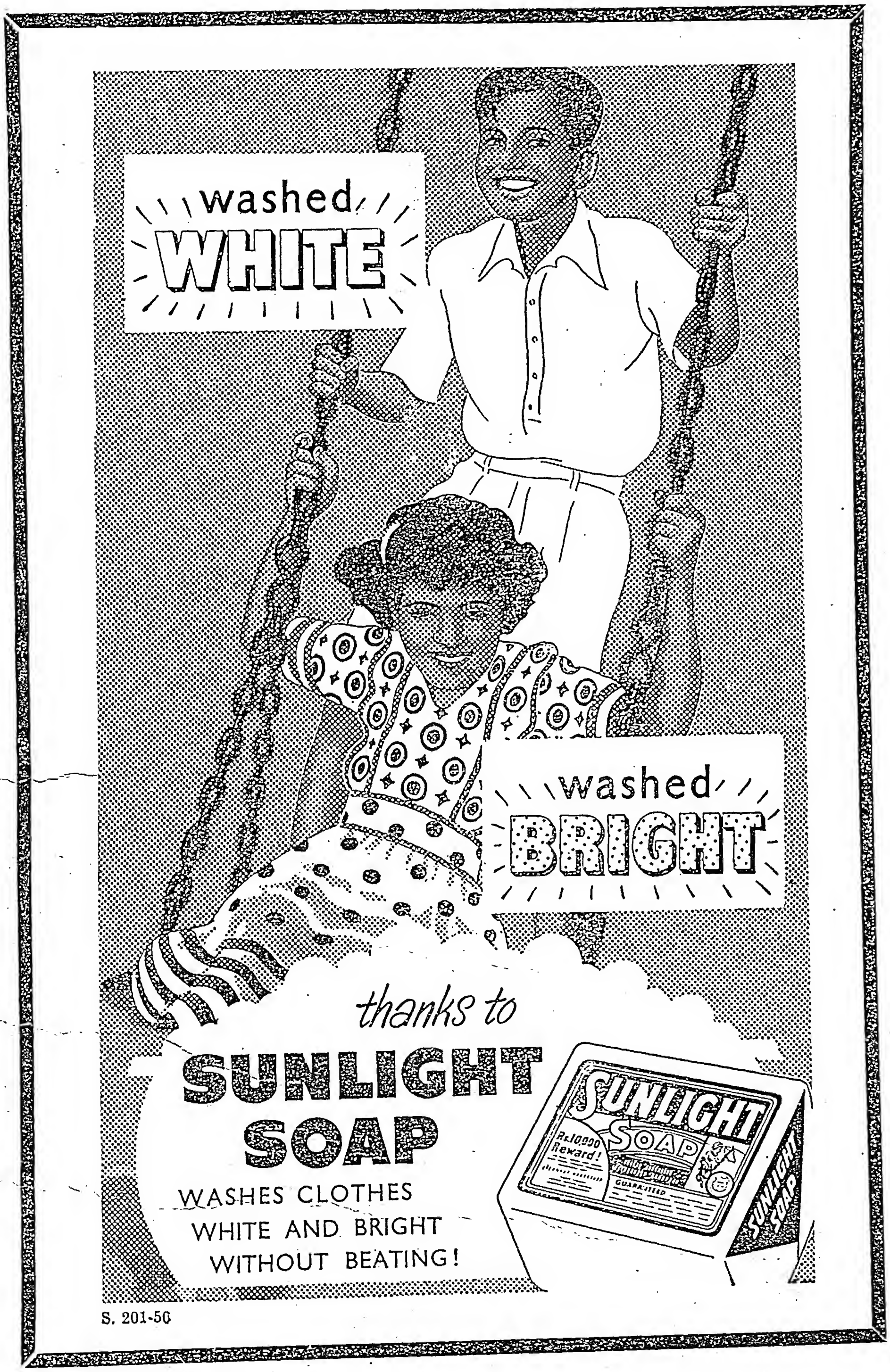
land; he had converted it into something worthwhile, when it had been taken away.

I told my friend, that he should make allowances for the unsettled conditions of 1947, when Punjab was in the throes of a great upheaval. Reluctantly he admitted that this was so, but he had yet another complaint. His house, which we had now reached, was evacuee property. He told me that after occupying it, many small improvements had been made by him. The government had now asked him to pay rent for the period that he had occupied the house, but it refused to consider the expenses he had incurred in making it habitable!

This was a sore point with my friend and he harkened back to it time and again. I avoided arguing with him, for it would have been of little avail.

As we took our seats on the *charpoy*, a letter was brought in. The letter was in English, so Walaiti Ram passed it on to me. The Indian Council of Agricultural Research had written to say that he had been adjudged the winner of the first prize for gram. He had to choose between a cash prize of Rs. 5000 and a tractor. When I asked the farmer which he would prefer, his eyes lit up with joy. Without a moment's hesitation he said "I shall take a tractor—I have always wanted one of my own. Since you are going to Delhi, Sahib, tell them of my choice". This I did on my return.

As we bade good-bye to Walaiti Ram, he said, "With the tractor I had taken out on hire, I ploughed up the fields of some of my poor farmer friends without charging them anything. With my own tractor I could help many others." I had no doubt about the sincerity of this spontaneous gesture.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Hints to the farmer:

Better Farming

By

A. R. KHAN, Division of Agronomy, Indian Agricultural Research Institute, New Delhi

In the previous articles of the series detailed information on the best methods of growing different crops has been furnished. Through this concluding note, it is intended to acquaint the better farming enthusiast with those basic requirements which largely determine the yield. Success in farming generally depends on the fulfilment of these needs, a discussion of which follows :

SEED

The first thing that comes to the mind of a farmer is about the procurement of good and pure seed. It is needless to repeat the information already given about improved types of different crops in the columns of this journal. Good seeds can be obtained from the local seed depots or by applying to the State Director of Agriculture.

The increase in yield from improved types has been marked. In the case of sugarcane it was phenomenal. There is one thing, however, which we should try to remember in this connection. The yield of crop plants is governed by the internal qualities of the plants themselves, and the external conditions under which they live. If these twin demands are not properly met, desired results cannot be achieved. In order to draw maximum benefit from improved seed one should try to provide them with such conditions under which they have best chances of showing their superiority. Besides water, which is absolutely essential for all crop plants, the other necessities are : good tilth of seedbed, adequate fertility of the land and proper handling of crop during growth.

TILLAGE, FOR SEED-BED PREPARATION

The experience of several generations handed down to farmer has developed the art of cultivation to a high stage of perfection. In the traditional knowledge, no doubt, many scientific principles are hidden. Yet it is the most costly single item in arable farming. This is, perhaps, because too much attention has been paid for the refinement of 'tilth' without knowing its reflection on costs.

Many years ago deep ploughing was strongly advocated for getting bigger harvests. Several experiments were conducted in different parts of the world to determine the optimum depth of ploughing for wheat and other crops. Similar work is under way on the farms of this Institute. The results so far achieved have clearly indicated that normal depth of ploughing—4-5 inches—is the most suitable depth to plough. These findings are in general agreement with the results obtained by other workers.

Regarding frequency of cultivation, our work has been mainly with maize and wheat. In an experiment having frequencies of 2, 4, and 6 ploughings for seed-bed preparation of maize along with usual bullock hoeings, best results were obtained when 2 ploughings were combined with three hoeings. Similarly for wheat, when 3, 6, 9 and 12 ploughings for seed-bed preparation were compared, the highest yield was obtained from plots receiving 9 ploughings.

Conclusion may, therefore, be drawn that normal depth of cultivation as generally obtained by bullock-drawn implements is the most practical depth to work. Advantages accrue more from 'inversion' rather than deep ploughing. Just enough cultivation to keep down weeds and maintain soil in a receptive condition for water is the optimum cultivation. Timely, and not the frequent cultivation, should be the rule. Farmers would be well advised to follow these simple principles for getting bigger yields and economic returns from their lands.

MANURING

For a country like India, where cattle cannot be divorced from agriculture the maintenance of soil fertility should not be difficult. If we give back to the land what has been removed by crops the fertility would not decline. Unfortunately, the scarcity of cheap fuel has led to the burning of a valuable and handy manure. Two-third of cattle manure is converted into smoke, and the one-third left is so badly stored that it loses most of the plant food before reaching the soil. The use of other alternative forms of manure is restricted due to economic and other factors. The only cheapest method to supplement this deficiency is, therefore, by growing legumes and green crops in rotation.

There are many who rightly consider the inclusion of legumes as the first and foremost requirement of rotation. They call it 'core' of the rotation. In fact the practice is as old as the art of manuring crops. Or how else, should we interpret the inclusion of those crops in rotation that would shed leaves for incorporation into the soil. Of the many legumes that have been tried 'berseem' has been found to be the most outstanding. In certain cases when fertilized with phosphate at the rate of $2\frac{1}{2}$ md. of triple super per acre the fertility built was sufficient to mask completely the effect of added dose of fertilizer or manure to subsequent crops of paddy, wheat and maize.

Ploughing under green crops for manuring has been the cheapest and most successful farm practice. Under favourable circumstances the increase in yield of the following crops has been 100 per cent. There is a wide experience and experimental data to support this statement. Some of the crops for which green manuring has been found successful are: transplanted paddy, sugarcane and wheat. A crop universally recommended for this purpose is sannhemp.

In order to have full advantage from green manuring, farmers should arrange the sowing of green crop in a manner so as to facilitate its burial at a stage when it would furnish the maximum amount of plant food to the soil. The time lag plays a very important part in the decomposition of organic matter and making nutrients, formed during the process, available to the following crop at the opportune time.

Green manuring in short is a practice of 'timings.' It succeeds only when the time of burying the green crop fits in with the time of sowing the next crop. Our investigations, as well as those of other workers, have clearly indicated a 2-month interval for either, as the best. If this is followed green manuring not only becomes a sound practice but also a valuable aid in farming.

CROP HANDLING

Eradication of weeds which compete for moisture and food with the crop is essential. This can be done cheaply and effectively with bullock-hoes provided the crop is sown in lines. The sowing of *kharif* grain crops at a distance of 2 ft. or so is, therefore, imperative. Our experiments with maize have clearly brought out the superiority of 'interculture' over thorough preparation of seed-bed. Farmers can increase yields and save money by sowing grain crops during *kharif* in lines.

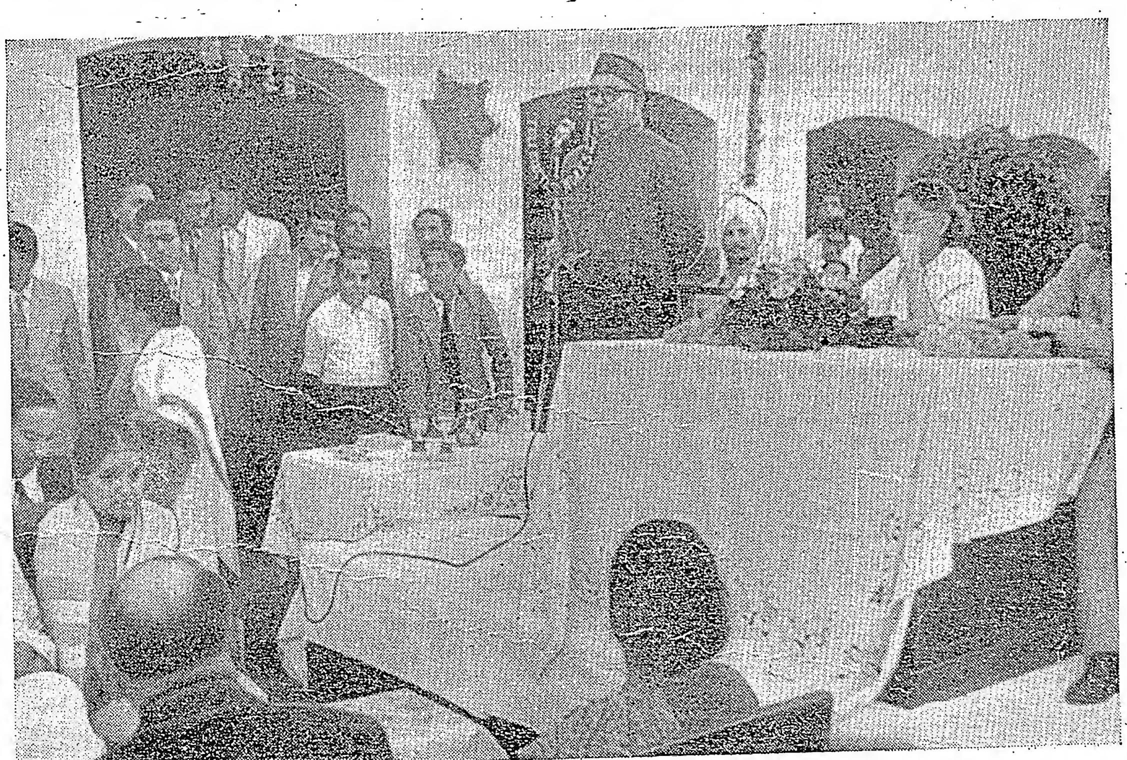
In the end, it is hoped that by adopting the practices outlined above, farmers would produce conditions commensurate with the best development for seed. Unless this is done, better farming will remain but an empty dream.

EDITORIAL (*Contd. from page 3*)

ALL INDIA WOMEN'S FOOD COUNCIL

The All India Women's Food Council is extending its good work to popularise non-cereal food. The Council has made great progress during the last two years as was apparent from the statement Shrimati Lilavati Munshi made on the occasion of the second anniversary of the Annapoorna Cafeteria in New Delhi. This was the first cafeteria opened in January, 1951. In about two years' time in February, 1953, the Council had 17 cafeterias to its credit situated in different cities all over India. The work of the Women's Council has been well appreciated by the State and Central governments as well as by the people.

The Annapoorna 'movement,' we are happy to note, is no longer an experiment. It has taken roots and is doing useful work on the country's food front.



Shri Rafi Ahmad Kidwai addressing the second anniversary meeting of the Annapoorna Cafeteria at New Delhi

THE DRUMSTICK

By **RAMPA PAL**

THE Saijan, (Sojan, Swanjena or *Moringa Oleifera* elsewhere) is a neat, one foot long rounded pod. So no wonder it is called the drumstick! The Saijan pods make delicious curries cooked by themselves, combined with onions and potatoes a mouth-watering savoury, while cooked with Arhar and Chana Dals, tasty Sambars. The tender leaves make good Bhujiva and Sag.

The flowers begin to appear in October, the pods form at the end of October and last till December. Then, a second crop appears from late March and lasts till the end of May.

The Saijan is a most useful tree—the buds, flowers, leaves and beans are prized as vegetable curries while the bark and root are of great medicinal value especially for rheumatic complaints. An Irani physician of the Old School says, a cup of Saijan soup (made by boiling the pods) taken daily for three months can effect a cure for rheumatism while a South Indian Vaid declares, a paste made from the bark is good for muscle-sprain resulting from falls. In Burma, the Saijan leaves soup is commonly taken by newly-delivered mothers for about ten days after the baby's arrival. Perhaps a little research by doctors and nutritionists will bring to light more uses of the Saijan.

The tree is quick growing and begins to bear fruit from the second or third year. Its branches are very soft and it is not always safe to climb on it to remove pods. The topmost branches often have to be sacrificed to get the pods with a bamboo pole. New branches, however, very quickly grow from these.

In Bombay, Madras, Bengal and Madhya Pradesh the tree is commonly grown for its fruit and flowers. But in Northern India, particularly in the Punjab and Pakistan regions, it is rarely seen; in Delhi Province and U. P. side, it is fairly well grown and the fruits are used in cooking. In the Punjab only the buds, flowers and the tiny soft tendril-like fruits are used chiefly—the buds as Raita, the flowers as a curry, while a delicious pickle is made from the tender little pods. Hardly any one thinks of making use of the mature pods. In some of the New Delhi Government Clerks' Quarters, trees loaded with pods meet one's eyes but no one seems to make use of them. Evidently, South Indian residents must have planted them during the pre-war days but as residences were changed every year probably during the Delhi-Simla migrations, the trees remained where they had been planted.

The Saijan fruit, flower, buds and leaves, all have a very slight bitterish (like mustard) tang but this is easily removed by giving them an immersion in hot water and draining them. In the case of the pods, they are scraped lightly and chopped into 2-3 inches long pieces over which some salt and turmeric powder are sprinkled and left for 10-15 minutes after which they are washed. This removes the slightly bitterish taste.

Last year the Ladies' Association of the Indian Agricultural Research Institute, held cooking demonstrations of the Saijan as practised in different parts of India and were able to show no less than eight different methods. The Punjabi and West U. P. ladies were very pleased to know how to cook the mature pods and to like the dishes made from them.

The vitamin and calorific value of the Saijan is quite high (Vitamin C, 120 mgms., carotene 184 Int. units per 100 gms., 7 calories per oz., Iron 5.3% per 100 mgms.). Such a useful tree and its fruits and flowers need to be popularised. Given below are few recipes for those interested in the Saijan Phali.

A DRUMSTICK RECIPE FROM ANDHRA

Ingredients:

Drumsticks	4 chataks
Rice	1 chatak (to be soaked & ground into paste)
Coconut	½ chatak
White sesame (Til)	½ chatak
Sugar	1 teaspoonful
Salt	according to taste
Urid Dal (white)	1 teaspoonful
Ghee	1 tablespoonful
Jira (cumin seed)	½ teaspoonful
Red dry chillies	2 or 3 (to be broken into pieces with the hand)

Method: Cut the drumsticks into pieces 2-3 inches long with a pinch of salt & turmeric powder and boil them (a light boil) in water sufficient to soften them. Soak the rice, coconut and Til seeds in a bowl with sufficient water to swell them. This should be done an hour before the drumsticks are put on the boil.

Then grind them all on the Masala-grinding stone with a little turmeric piece and salt (required for the whole curry) and make a paste and keep by. Now heat the *ghee* (or oil, if preferred) in a Degchi and put in it the Urid Dal grains, Jira and the broken pieces of red dry chillies. When these are fried brown add the boiled drumsticks and let them be fried for about 5 minutes; after this add the coconut, rice and Til mixture. Stir very lightly with a spoon so as to mix up the ingredients. Add a little water, cover and cook until it is ready.

CURRY FROM LEAVES

Take down from the tree the soft-looking leaves. Remove them leaf by leaf with the fingers discarding the stalks as they are hard. Immerse them in very hot water with a pinch of salt. Drain out water and keep by.

Chop fine 2 or 3 medium-sized onions, 1 or 2 green chillies, a piece of ginger.

Heat 2 or 3 tablespoonsful of *ghee* (or oil, if preferred) and to this add the chopped onions, chillies and ginger. Roll them about until they are half-browned. Add the leaves and salt to taste. Cover and cook on a gentle fire until it looks nice and soft.

With potatoes: Same as above but 3 or 4 medium sized boiled potatoes cut into pieces may be added with a teaspoonful of *garum masala* (*garum masala* is made up of equal parts of *jira*, big *elaichi*, *dalchini*, *dhaniya* with 2 cloves and a few pepper corns ground into powder) as soon as the onions, etc. are half brown. Stir them about, add the leaves and cover over a gentle fire until cooked.

DRUMSTICK CURRY

Take 6 pods. Scrape the surface lightly to remove green fibre. Cut into pieces, 2 to 3 inches long. Place in a vessel or pan sprinkling a little salt and turmeric over them and keep it aside for 10-15 minutes and then drain out water. Chop fine 1 large onion, 1 or 2 green chillies, 2 cloves of crushed garlic, a piece of chopped ginger, 1½ tablespoonsfull of *garum masala*.

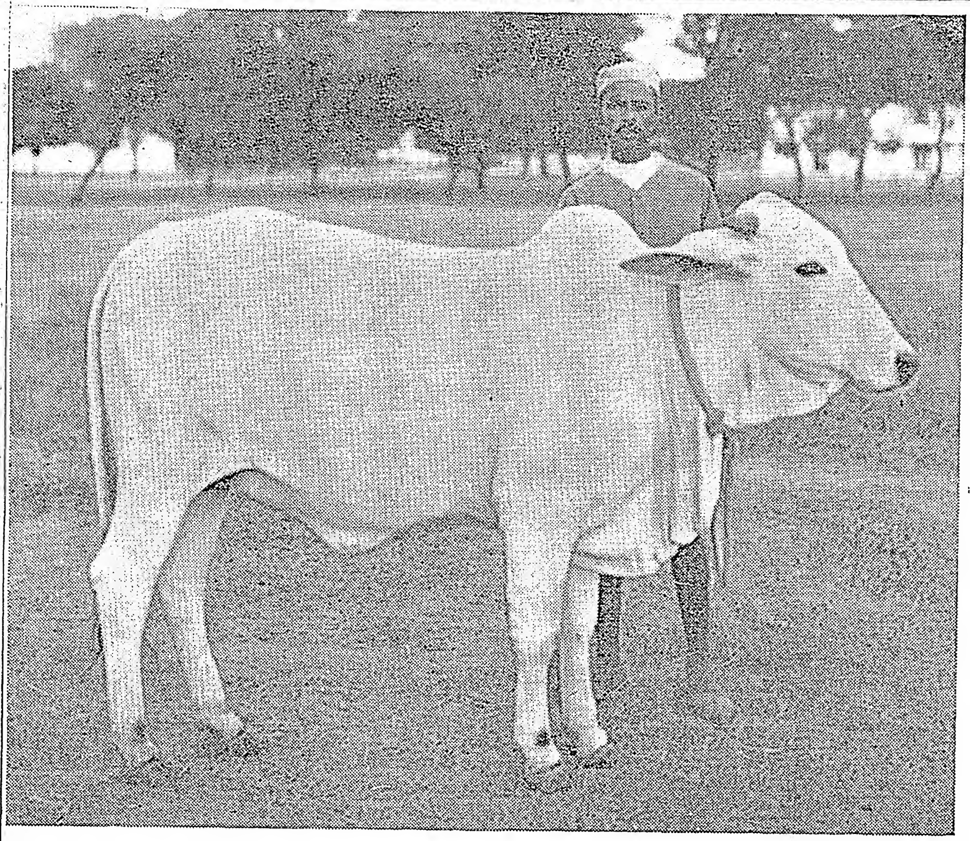
Heat a little oil or *ghee*, add the onions, etc., turmeric and salt to taste. Put in the Saijan pieces.

(*Contd. on page 32*)

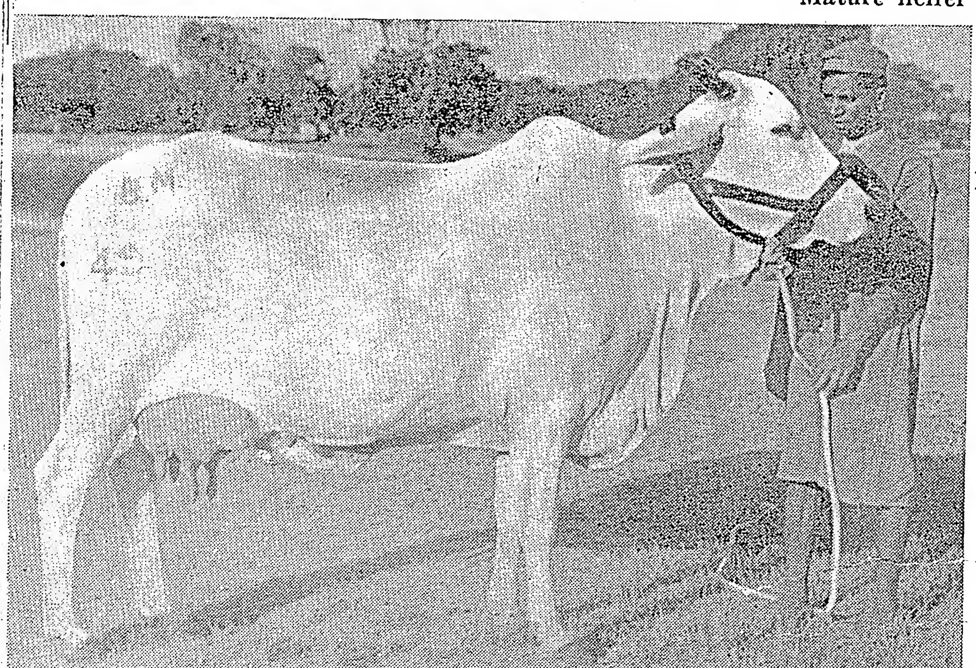
DRUMSTICK

EFFECTIVE US

By
J. D. SAMPATH KUMARAN,
Government of India Cattle Farm,
Karnal



Mature heifer



Mature Cow

STUDIES on the problems of fertility have drawn attention to the fact that the average percentage of cows which is fruitful for the first service is usually about 65. In the remaining 35 per cent fertility may either be temporarily or permanently absent and it is difficult to assess accurately the extent of loss from these. When the herd as a whole is viewed which is much more important than the individual animal, we have to consider more carefully. It would indeed be a matter for serious consideration when the annual conception rate based on first service or insemination is less than 50 per cent, the average number of services whether natural or artificial exceeds two, at least one-third of the females require more than three services per calf and the calving interval exceeds 460 days. These conditions may be due to several causes, for efficient reproduction depends upon the production of viable reproductive cells and the maintenance of the reproductive organs of the cow in the proper condition for heat, egg formation, fertilization and the subsequent carrying out of the development of the embryo to full term, the final calving in a normal way with the complete expulsion of the placenta in time. The retention of placenta would bring disturbances in the generative organs. Infections of the uterus may cause infertility by destroying fertilized egg or the developing unborn young.

Abnormalities of the male and female reproductive cells acquired during maturation, abnormalities of the uterine function, maternal nutritional deficiency and other diseases of the reproductive organs may bring about embryonic mortality and the consequent low breeding efficiency. Most of the cows have normal ovaries; however, there are variants and one might presume that not every follicle capable of producing an egg contains an egg-cell with potentialities of fruitful development. It is difficult to isolate the exact cause of low breeding efficiency; however, it is of interest to note that the quality of the semen used is only one factor. The reproductive functions of the cow are more often impaired and constitute the greatest factor in breeding failures.

The uterine development of the unborn young is a highly complicated process. The wandering of the male sex cell (spermatozoa) in the female reproductive tract, the term of life of the sex cells, the importance of certain biochemical agents are the problems which have been investi-

OF ARTIFICIAL INSEMINATION

gated during the past few years, but an analysis of these results shows that it is still not possible to draw up a simple outline of the mechanism of early growth and development of the unborn young.

Detailed investigations by several workers have shown that the semen characteristics are clearly related to fertility. The number of spermatozoa per cubic centimetre in an ejaculate should be 500 million and what is more important is the number of live sperm than the total number. For insemination the number required is at least 10 million. The average percentage of abnormalities is about 15 and consideration should be extended to those arising during the developmental stages; however, it must be noted that the apparently normal sperm may be physiologically abnormal. Metabolic tests such as respiration, sugar utilization and methylene blue reduction-time are of special value but are not specifically related to fertilizing capacity. Semen should have no pus cells, and should be free from transmissible venereal diseases.

The female component should be as far as possible standardized when any male fertilizing capacity has to be assessed by mating, at least 30 inseminations are required for the assessment of a single ejaculate.

A technique for a long term preservation of semen has been evolved and this would prove very useful in shipping semen over a greater distance and in avoiding wastage. Semen is diluted with citrate buffer containing glycerol to give a concentration of 10 per cent glycerol in the semen. This is maintained for 12 to 20 hours at 5°C, and the cooling is done at the rate of 2° per minute from 5°C to −15°C. Below −15°C to −79°C the cooling is quicker. Investigations indicate that semen was preserved up to 20 weeks and when it was thawed at 40°C (104°F) about 80 per cent of spermatozoa showed motility and that 38 cows inseminated with frozen-glycerol-treated-semen gave a pregnancy rate of 76 per cent. This technique is still in experimental stages and it is quite possible that more information would become available in the near future.

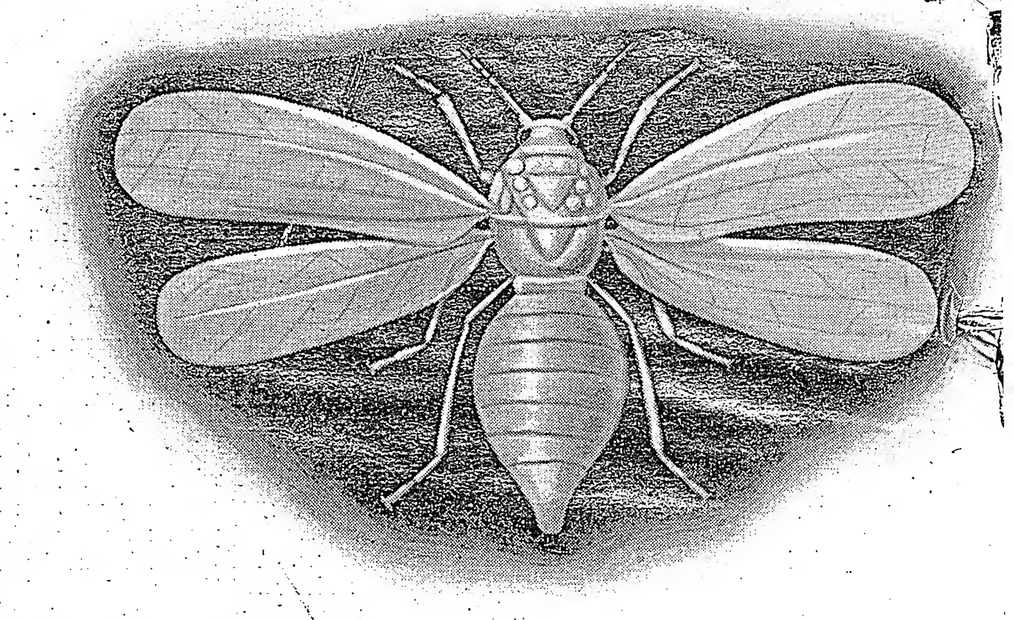
Successful application of artificial breeding depends to a great extent on timing service although the nutritional state and the incidence of venereal diseases are other factors which influence successful breeding. Heifers should not be bred until they are sexually mature. The average age and weight of a well-fed heifer at the sexually mature stage are round about 20 months and 600 lb. body weight; however, some do not mature until at a later age and such animals should not be bred until they reach full sexual maturity. Mature cows in production do not come in heat shortly after parturition. The first heat usually occurs at about the time or shortly after the maximum milk production which on an average occurs at 50 days. The mature cow should not be served at

(Contd. on page 30)

BREEDING TIME TABLE

BEFORE HEAT	HEAT			AFTER HEAT		
2 to 8 HOURS	4 to 22 HOURS			7 to 12 HOURS		12 to 30 HOURS
NERVO-USNESS MOUNTING OTHER COWS			HEAT ENDS HERE		EGG RELEASED	BLOOD PASSED HERE
TOO EARLY		GOOD	IDEAL	GOOD		TOO LATE

SMALL POX, infantile paralysis, yellow fever, influenza or the common cold, are some of the virus diseases which affect mankind; foot-and-mouth of the cattle and rabies or hydrophobia of the mad dog are virus diseases of animals. Similarly, there are a large number of virus diseases known today which affect plants all over the world and Bhendi mosaic is one of them.



An adult white fly

BHENDI MOSAIC AND

Mosaic of Bhendi is responsible for extensive losses in outturn of the crop and in certain areas it is known to completely destroy the crop. It has been observed that disease free plants yield four times the fruit as compared to the diseased ones. The plants affected by the disease can be distinguished by the bright yellow colour of the veins of their leaves which may be curled and twisted. Affected plants are dwarfed and produce small, malformed and pale fruits having tough skin unlike the green, tender and long fruits produced on healthy plants. The market value of the fruit from diseased plants is considerably low because of their tough and fibrous nature.

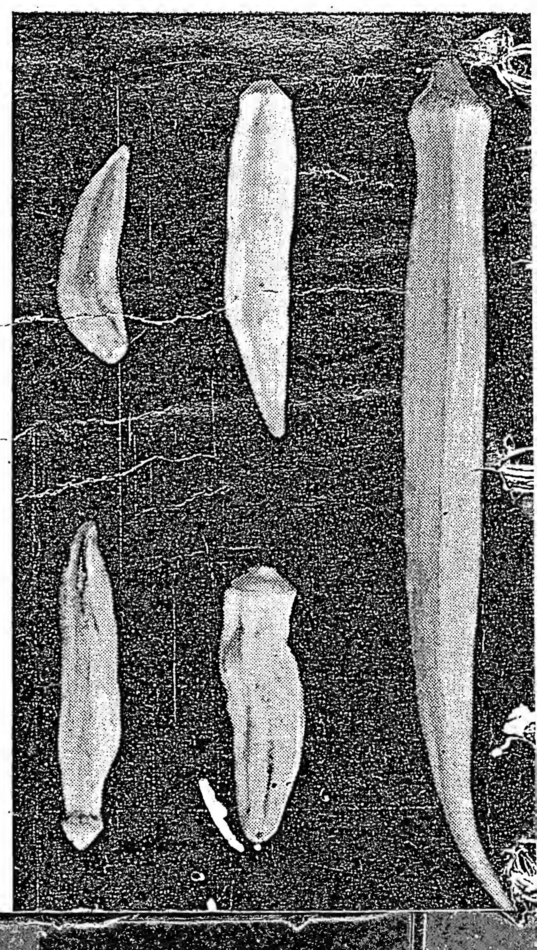
SPREAD OF THE DISEASE

Like the germs, the viruses are also transferred from one victim to another. The Bhendi mosaic virus is transferred by the agency of a tiny insect, the white fly which breeds and feeds on Bhendi. The white fly imbibes within itself the virus of Bhendi mosaic while feeding on a diseased plant. This insect thus carries the infectious principle from the diseased plant to healthy plants during its unrestricted flight from plant to plant though unintentionally, for it knows not what poison it carries in its body. The virus of the Bhendi mosaic has no detrimental effect on the white fly. Once infectious, the white fly retains the power to transfer the disease (if permitted to feed) on a series of healthy Bhendi plants throughout its life span of about 30 days. In addition to diseased Bhendi, there are some plants, such as hollyhock (*Althaea rosea* Cav.) and a weed known as 'wild Bhendi' (*Abelmoschus manihot* (*L.*) Medik.) in which the virus over-winters. The white fly can always pick up the virus from these if growing about, and transfer it to the newly grown healthy crop of Bhendi.

CONTROL OF THE DISEASE

The success of control of a virus disease depends largely on how far every one who grows the crop either in a kitchen garden or on a large scale cooperates in the efforts made for controlling the disease. Once a plant is diseased with a virus, it is diseased for ever. It cannot be cured. It has to be destroyed and disposed of cautiously lest it may act as a source of infection. Also, the area where the crop is cultivated must be kept free of weeds because these

Small, malformed and pale fruits with tough skin collected from diseased Bhendi. A long tender and green fruit of healthy Bhendi can be seen on right



help in increasing the number of insects that carry the virus. The following schedule for the control of Bhendi mosaic has been found very effective in Poona.

Observe a 'close period': In Poona, two crops of Bhendi are raised, i.e. one in summer and one in winter, the major crop being the summer one, so that the Bhendi crop is in the fields practically all the year round. It has been found that to control the disease, Bhendi should not be cultivated for at least 2 months in the year. The 'close period' may be selected just before the major crop of Bhendi is sown. It would, however, vary from locality to locality. During this 'close period' all standing

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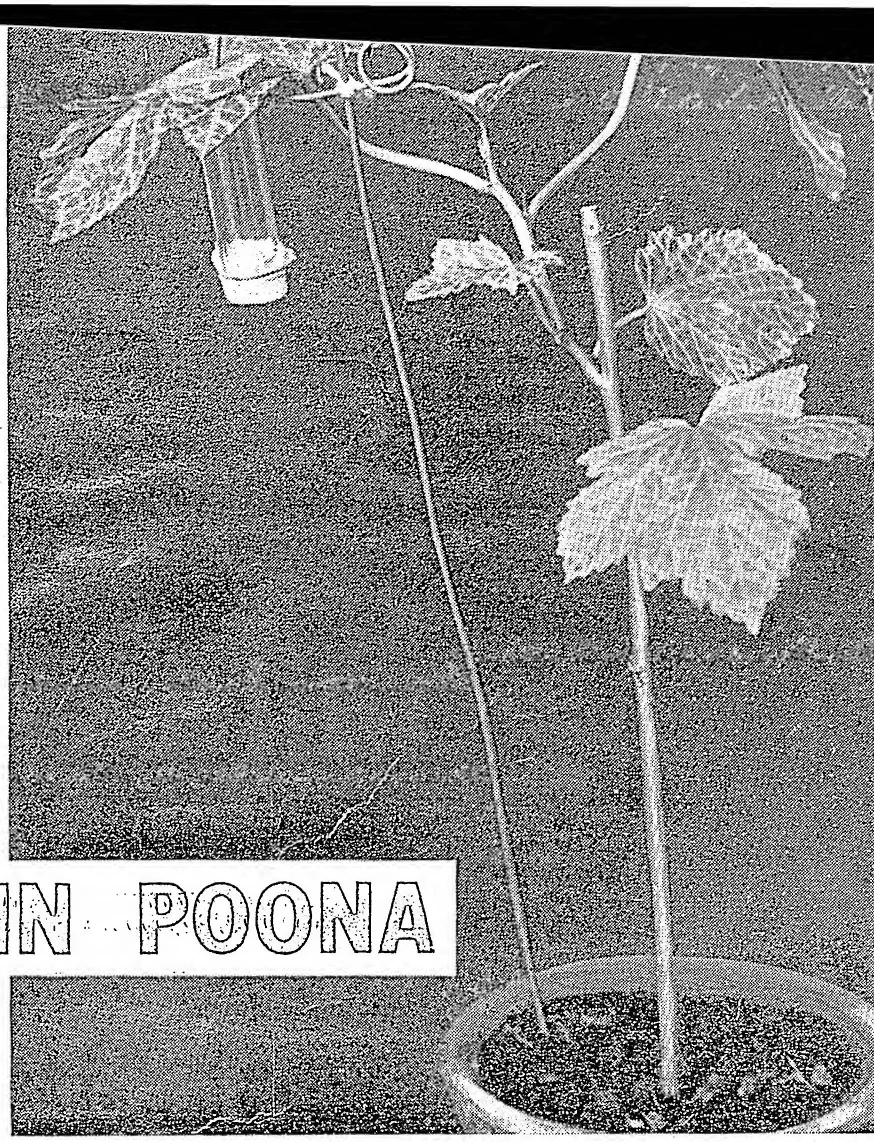
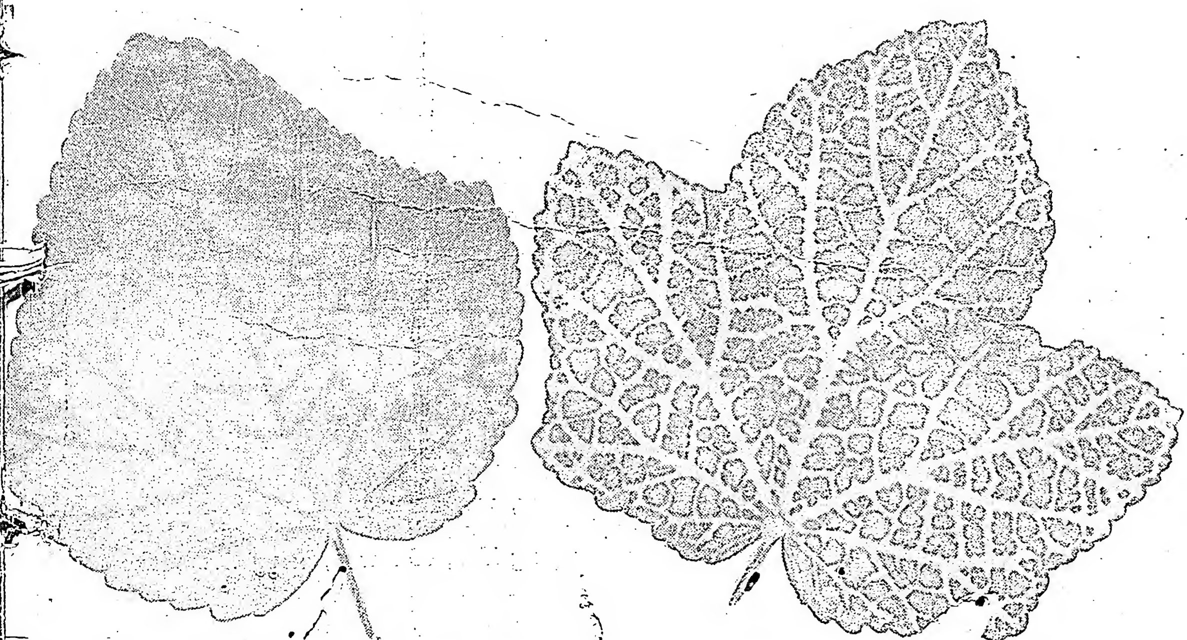


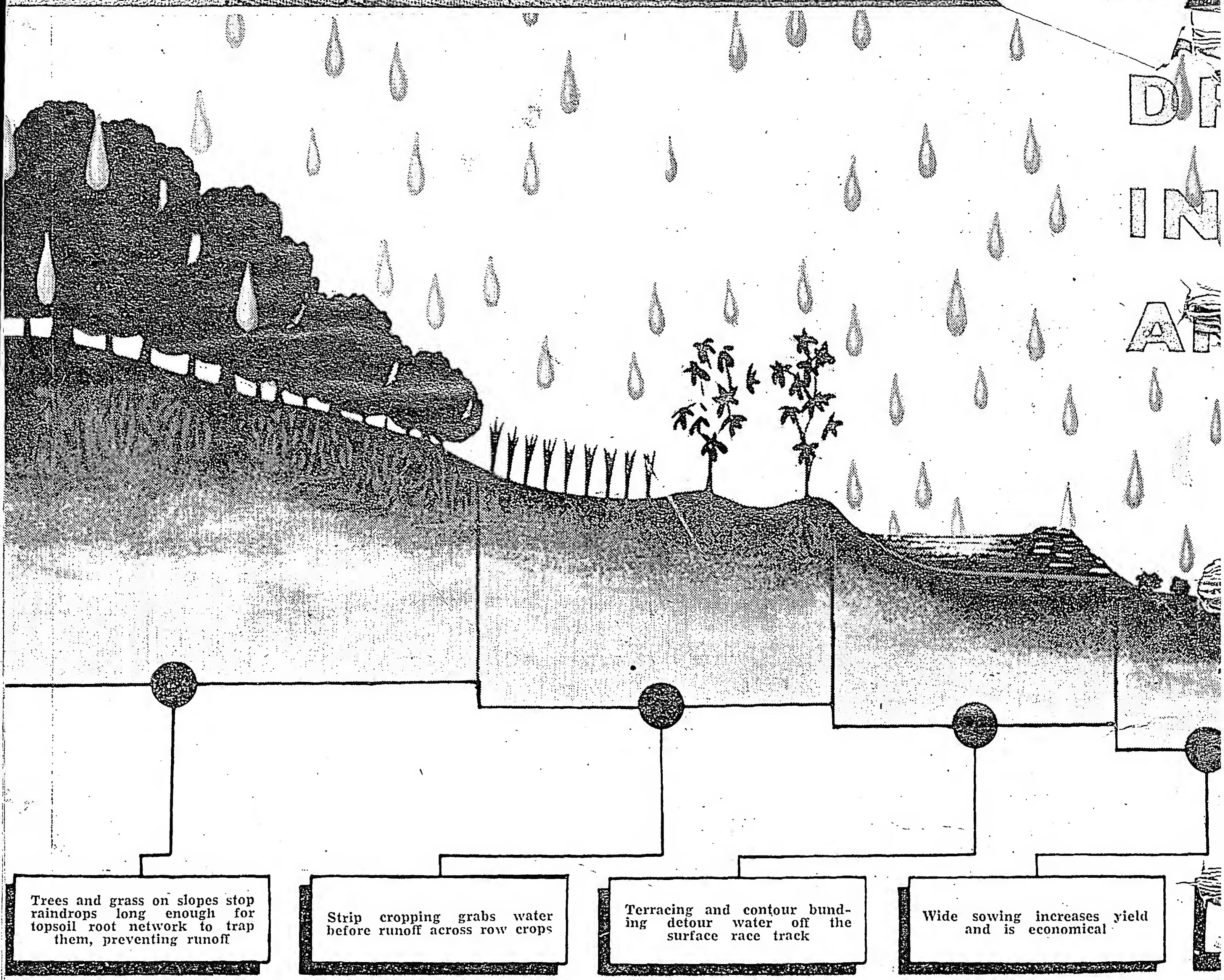
Feeding white flies in a glass cage fixed on diseased Bhendi leaf for experimentation

ITS CONTROL IN POONA

By
S. P. CAPOOR & **P. M. VARMA,**
Division of Mycology and Plant Pathology, Indian Agricultural Research Institute, New Delhi



Leaf of a mosaiced Bhendi plant showing typical bright yellow vein symptoms. A healthy leaf is on left.



By **D. M. ANAND**

WATER is a nation's life-blood and all successful farming is founded on its availability and proper use. In India, where the overwhelming cultivable area has no irrigation facilities, farmers as a rule, are aware of the importance of securing an adequate supply of water for their crops. But, in spite of this, a large proportion of the precious water that falls over our land every year, in the shape of rain during the monsoons, is wasted. It flows into our rivers, causing devastating floods in the countryside.

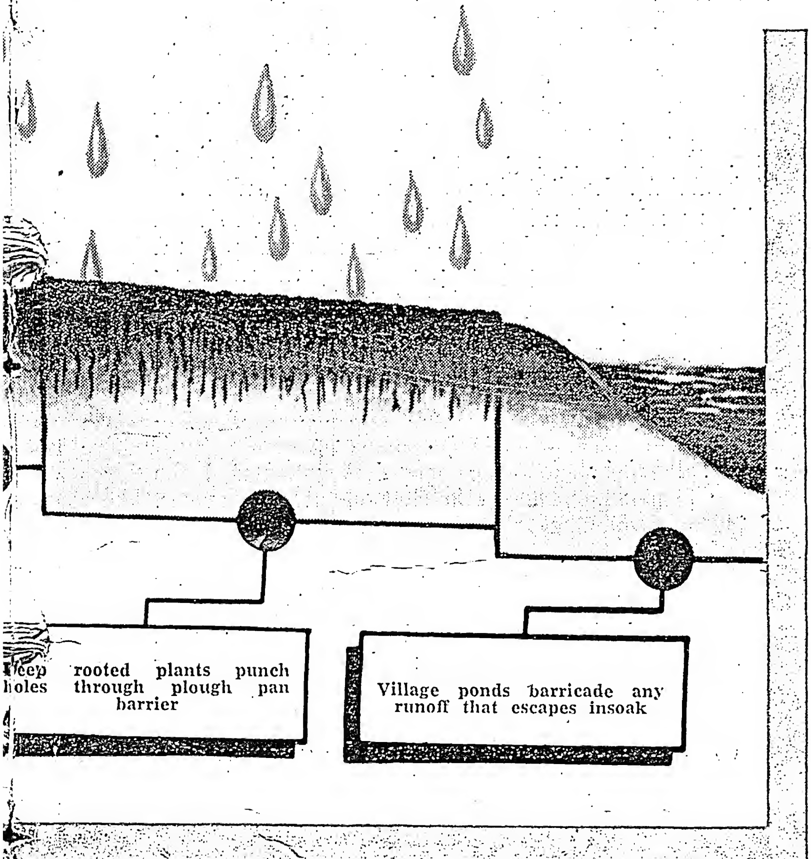
Dry farming can, therefore, form the best basis of successful flood control. But there is something which is even more important from the point of view of a farmer. Research schemes conducted in the various parts of India, particularly in Bombay, Hyderabad and Madras, have shown that it can greatly increase farm profits. Striking results regarding increased production have been achieved by the adoption of a simple programme of water conservation and improved cultural practices in the dry tracts of these States.

WHAT IS DRY FARMING ?

Dry farming is nothing more than a programme of good soil management and improved cultural practices, designed to conserve all available water for crop production in areas of low, uncertain and variable rainfall. Its character is correctly indicated by the term "in-soak," the underlying idea, of course, being that if the

* As the dry farming practices vary in different parts of the country, it is proposed to issue a series of three articles embodying the recommendations of the Agricultural Departments on the subject. This article, which is the first of the series, describes the dry farming system of cultivation as practised in the Deccan and the Karnatak areas of Peninsular India.

RY FARMING THE DECCAN D KARNATAK*



land is properly managed and correct cultural practices are followed a great deal more water will soak into it, than would be the case in normal circumstances.

Thus, every farmer will be able to make the fullest possible use of all the water that falls on his farm, and instead of running into rivers and causing floods, the monsoon water will be available in the dry season and help to grow larger and better crops. Dry farming, in short, is a programme of soil and crop management designed to conserve the maximum quantity of water on a particular piece of land.

The various practices comprising this programme naturally differ with the nature of the soil and its quality. But as the black soils of the Deccan and the Karnatak form a compact unit, a schedule of crop and soil practices has been devised, as a result of the various research schemes, particularly those conducted in Bombay, which can well be styled as a system and is applicable to all the dry tracts of this area of our country. These practices can perhaps best be described under the following heads :—

(*a*) Field Bunding (*b*) Improved Methods of Tillage (*c*) Manuring (*d*) Crop Rotations and Fallows (*e*) Strip Cropping

AREA SURVEY—FIRST STEP

In determining any programme of dry farming, the first step will naturally be to survey the area and classify the land, so that its proper use can be decided, and the best practice for water conservation adopted.

In such a survey and classification, the following principles should be borne in mind :—

(*i*) Afforestation should be recommended for all lands where cultivation is not possible, such as eroded or poorly drained land, and land which is frequently flooded. Also villagers should be encouraged to put under trees all land with more than 12 per cent slope.

(*ii*) Medium slopes able to support a good legume or grass cover, should be used as meadows to provide fodder for cattle.

(*iii*) Only relatively level land should be used for crop cultivation.

FIELD BUNDING

The object of constructing small bunds of earth is to help to reduce the speed of the rain-water run-off and thus make it possible for the land to absorb more of it. A contour is an imaginary line on the surface of the earth connecting points of the same height. Contour bunding, therefore, means constructing small bunds of earth on the same level across the natural slope of the fields—at least as far as possible. Bunds so constructed serve to check run-off, reduce its abrasive and carrying capacity, break the one long slope into several shorter ones, and thus prevent the loss of valuable top soil.

The height of the contour bunds and the distance between them in any system of dry farming will vary according to the slope, the area to be protected and the type of soil.

In the Deccan, in general, it is recommended that the height of these bunds should be about 1 ft. to $1\frac{1}{2}$ ft. for every slope of 1 ft. in the land, and the width at the base should be about 3 ft. for every foot of height of the bund.

When preparing bunds the soil should be loose so that it can be readily used. A ploughed area is the best. If the land is not ploughed or loose, a few furrows, covering the required base width of the bund, should be opened across the slope of the field at the places where the bund is to be constructed. A few more furrows may be opened up to provide the necessary loose soil for the construction of the bund, which may be prepared by hands or a bullock drawn shovel, bund former or leveller (*keni*). Clods should not be used in constructing bunds.

In general, bunds should be constructed at every 3 ft. of vertical drop in the land. Waste weirs should be constructed at suitable heights and at suitable places in the bund in order to enable storm water to pass without damaging the bund. Research schemes conducted in Hyderabad, Madras and Bombay have shown that the formation of these bunds has consistently increased yields by as much as 11 per cent to 22 per cent over non-bunded areas.

Bunding on the fields of cultivators should be carried out in a whole catchment or sub-catchment area.

IMPROVED METHODS OF TILLAGE

Ploughing : It has been found by experience that in the Deccan soils, ploughing as a water conservation practice does not yield good results. It is, therefore, recommended that light, shallow and medium deep soils of the Deccan should *not* be ploughed. Only deep soils should be ploughed and that too once every three or four years. A good method of arranging this is to divide a field of deep black soil into three or four equal parts and plough one of these parts in succession every year.

Lands that are badly infested with weeds, however, should be ploughed every year until the weeds are removed.

Contour ploughing should be practised and land should always be ploughed across the slope.

As far as possible deep ploughing should be done because it breaks up the hard surface of the soil, thus admitting water to the sub-soil and thereby prevents any run-off over the plough pan, after soaking through the top soil. Moreover, it eradicates deep-rooted weeds and helps the land to retain more of the rainfall. The Kirloskar, Watandar, Bahadur and C.T.2 ploughs will be found most useful for this purpose.

The best time to plough the land is after the *rabi* crop has been harvested, that is, at the end of March or the beginning of April.

Harrowing : This practice is useful because it helps to prepare a good seed-bed by breaking down clods of earth and destroying all weed growths. Moreover, it opens up the soil and makes it able to absorb more of the rain water. In the Deccan soils, two to four harrowings give good results. Each of these should be given, if possible, after a good shower of rain. Moreover, harrowing, like ploughing, should be done *across* the slope of the field. For the soils of the Deccan it is recommended that :

(*i*) in the case of deep soils four harrowings should be given, the first of these being carried out about three weeks after ploughing and each of the remaining three to be given at an interval of a month, if possible ;

(*ii*) in the case of medium, deep and shallow soils two harrowings should be given, one in June and the other in July if the rains are early, or one in July and the other in August if the monsoon is late.

Sowing : Contour sowing, that is sowing across the slope of the field, gives the best results.

Further, it has been proved by various experiments that, generally speaking, a lower seed rate than that which is generally adopted by cultivators gives a better crop in dry tracts.

For *rabi jowar* crop in the Deccan, it is recommended that the spacing of the seed drill should be 18 ins. between rows with a seed rate of 4 lb. per acre. In Madras, the local spacing between the lines of cotton is 27 ins. and sorghum 13$\frac{1}{2}$ ins. It has been found that a slightly wider spacing of 36 ins. for cotton and 18 ins. for sorghum is more beneficial. The new spacing was tried in an area of over 138 acres spread over three seasons. It was found that it affords facilities for raising crops with greater surety in years of low rainfall ; crop yield is not less than in the local spacing in years of normal or heavy rainfall. Wider spacing also results in saving of seed and greater ease and quickness in inter-culturing.

Improved strains of seeds, particularly suitable for cultivation in the unirrigated lands of the Deccan and Karnatak are being developed by several research stations. Information regarding these strains can be obtained from the State Departments of Agriculture.

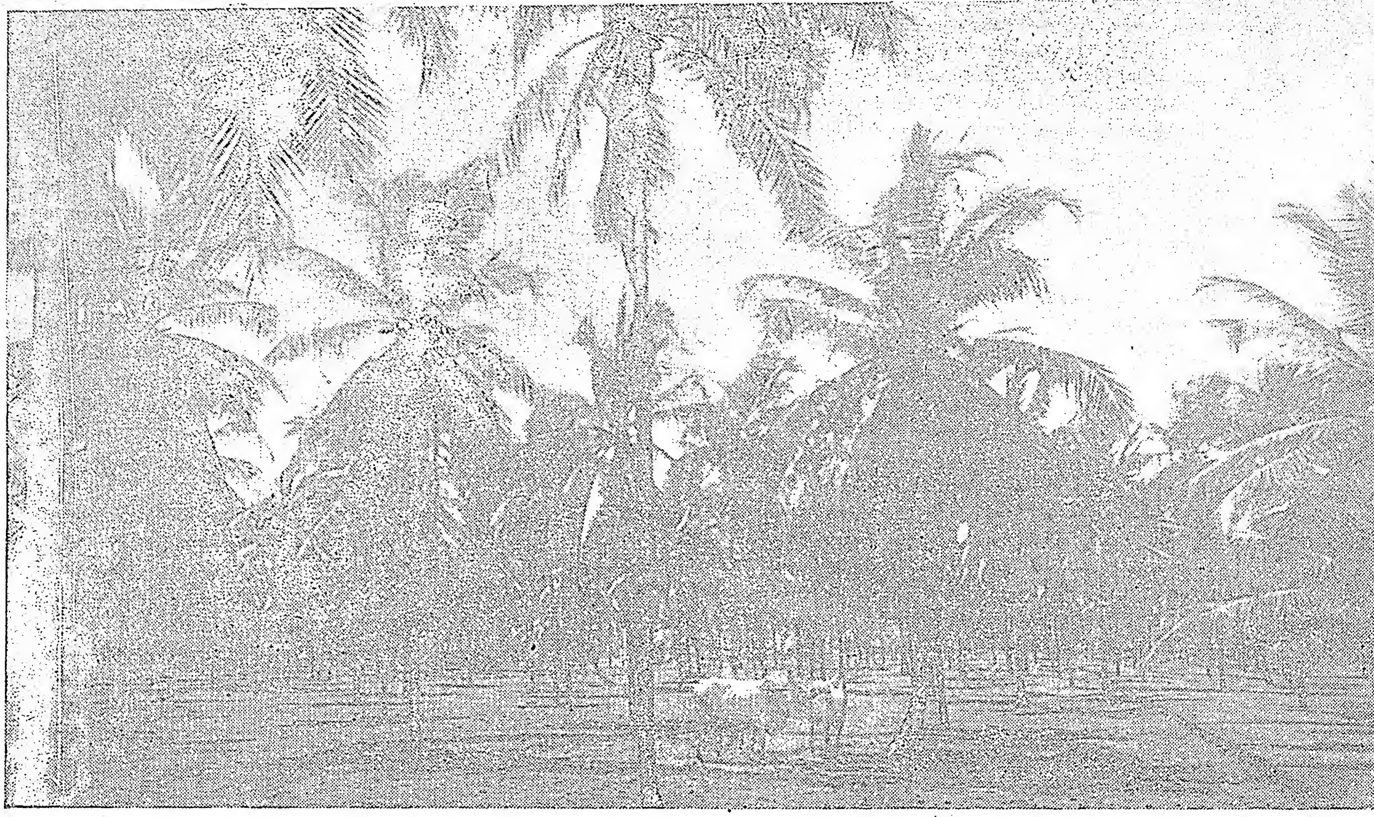
Trials conducted in Madras, for example, have shown that the strains of sorghum N-47-3 (Bombay Type) and H_1 (or Type 1 local type) are particularly useful in dry tracts of South India. Similarly, trials conducted in Bombay have proved the value of M.35-1 *jowar* seed.

In the case of *jowar* in South India, the seed should be treated with sulphur powder before sowing to prevent smut disease and the seed should be sown at a depth of 3 to 4 ins. below the surface.

Inter-culturing : After the crop has germinated the most important operation is that of inter-culturing. This creates a blanket of loose soil on the surface of the field which prevents breaking of soil surface and loss of moisture by evaporation. Moreover, it helps to destroy the weeds which use up the food materials and moisture in the soil which are required by the growing crop. The number of inter-culturings and their frequency vary with the type of soil. For the Deccan and Karnatak it is recommended that :

(*i*) four inter-culturings should be given in deep soils during the growing period of the *rabi* crops, i.e. October to January at intervals of three

(*Contd. on page 29*)



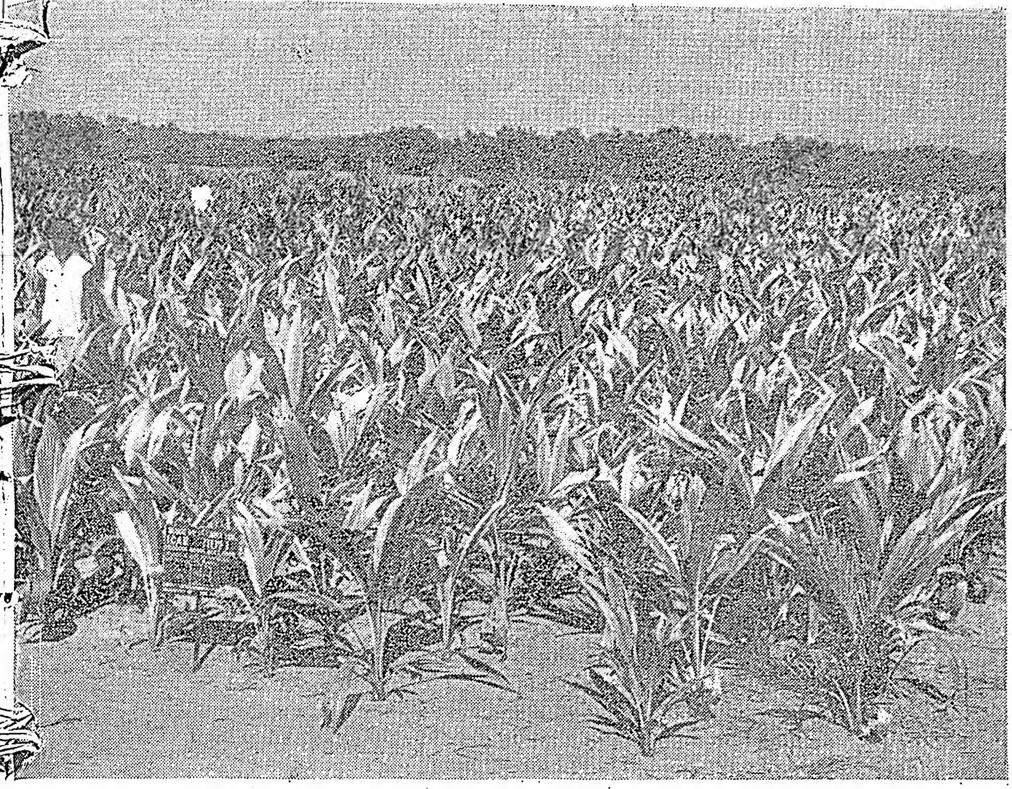
A well-spaced-out coconut garden

COCONUT CULTIVATION IN WEST

ALTHOUGH the coconut is a familiar and picturesque feature of the West Bengal landscape, its potentialities as a commercial crop do not yet seem to have been fully realized by the people of the State. The cultivation of the coconut is not done on a plantation basis in West Bengal. They are found scattered about in homesteads or on the borders of high level land round holdings along with other trees of no great economic value. Neither in the matter of planting nor in after-care and maintenance are proper methods followed and the tree is expected to grow and yield without much attention being bestowed on it. The area under coconut in the State according to the latest available figures has been estimated at 15,716 acres and yield at 103,081,000 nuts per annum. The crop is mainly concentrated in the 24-Parganas, Howrah and Hooghly districts, but hardly any part of the yield is utilized for the production of copra or coconut oil. The nuts are generally harvested in the immature stage for sale as tender nuts, for which there is very considerable demand in Calcutta.

The conditions in West Bengal are reported to be almost ideal for coconut cultivation. The deep rich alluvial soil of the Gangetic Delta and the availability of subsoil water within easy reach of the roots of the coconut palm in summer are considered to offer proper conditions for the healthy growth of an abundant yield from coconut palms. Not only can the area under cultivation be extended but the yield from existing gardens can also be enhanced by adopting improved methods of cultivation and by means of proper manuring and inter-cultivation at the appropriate time. The planting of coconuts can be done on a more extensive scale in the homesteads and round-about the numerous tanks that form a special feature of West Bengal's rural areas. The palms can also be planted on raised bunds on the borders of paddy fields and other holdings especially in the districts of 24-Parganas, Hooghly, Howrah and Midnapore, without in any way affecting the production of other essential crops like paddy or jute.

(Left) A poorly developed seedling unfit for planting. (Right) A vigorous seedling fit for planting. Note the large number of leaves and roots, good girth at collar, height and general vigour



A Coconut Nursery

BENGAL

By **K. GOPALAN,**
Secretary, Indian Central Coconut Committee

THE COCONUT DEVELOPMENT SCHEME

A five-year scheme for the development of coconut cultivation in West Bengal is one of the important development schemes recently sanctioned by the Indian Central Coconut Committee. It started functioning on the 1st September, 1952 and the Committee proposes to spend on it a sum of Rs. 37,250.

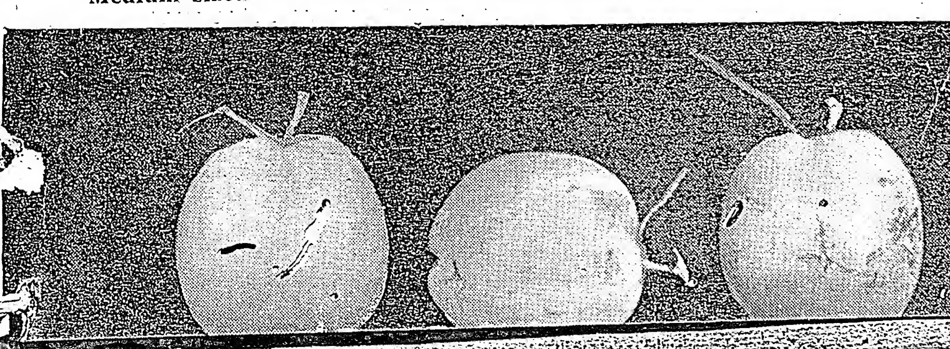
Unfortunately, the vast majority of coconut growers in West Bengal is not properly educated regarding the right methods of raising coconut plantations, their cultivation and manuring. The Coconut Development Scheme in West Bengal also aims at carrying out intensive propaganda on the following lines, through a special field staff appointed for the purpose. The staff of the State Department of Agriculture cooperates with the special staff in the matter and devotes attention to the following items of work among others :—

1. Importance of planting quality coconut seedlings
2. Proper spacing between palms and proper depth of planting for seedlings and thinning out of overcrowded gardens
3. Inter-cultivation and manuring practices and utilization of farmyard manure, green leaves, ash, etc. as manures
4. Measures for the control of pests and diseases of the palm
5. Proper stages at which tender and ripe nuts should be harvested and utilization of different parts of the palm

USE QUALITY COCONUT SEEDLINGS

The choice of proper planting material that will ultimately give good yields is of the utmost importance in the case of coconut as it is a perennial tree living for over 80 years and its bearing capacity can be judged adequately only after about fifteen years of planting. To obtain proper seed material particular attention has to be paid to the selection of mother palms, selection and harvesting of seednuts, preparation and maintenance of the nursery and the selection of the seedlings. Mother palms should be heavy and regular yielders of middle age, healthy-looking, vigorous and robust with thick-set crowns and short and thick petioles and peduncles. Seednuts should be harvested only when they are fully mature and lowered to the ground with a rope instead of allowing them to drop on the ground. The water inside the seednuts should not dry up and, therefore, they ought to be stored in fine sand instead of being exposed to the atmosphere. It is undesirable to plant seedlings which are less than nine months old and only such seedlings should be selected as are healthy, vigorous and robust-looking with a large number of leaves, having good girth at base, short thick stalks and a large number of roots. Unhealthy seedlings with poor, stunted growth and those that are thin and lanky or markedly different from the general lot should be rejected. If the criteria of selection prescribed above are adopted, about 20 to 40 per cent of seedlings will get rejected. Very little attention seems to be paid at present in West Bengal regarding the quality of the seedlings. Any nut that sprouts is considered good for planting. The Indian Central Coconut Committee is, therefore, financing jointly with the West Bengal Government, since June, 1951, two coconut nurseries for raising and distributing quality coconut seedlings. They are situated at Tollygunge and Chandernagore and have between them an annual output target of 24,000 seedlings. The seedlings are sold at the special concession rate of 8 annas each, ex-nursery.

Ideal seednuts. Seednuts should be fully mature but not dead ripe. Medium sized nuts with nearly round shape are better than others



PROPER SPACING AND DEPTH OF PLANTING

At present coconut palms in the State are not found properly and regularly spaced and are rather closely planted. Surface planting has invariably been adopted with the result that the bole or the root-forming region in the old trees is exposed. Generally speaking, coconuts should be planted in such a way that the bole is well within the soil when the tree grows up to a good age. Irregular and too close planting of coconuts should be avoided. They should be planted in straight rows at regular intervals to facilitate the carrying out of proper inter-cultural operations with labour-saving implements.

If coconuts are to bear well they should receive plenty of sunlight. Where trees are overcrowded, they tend to grow tall and lanky in their struggle to get sunlight. Considerable energy is thus used up in producing a tall trunk at the expense of yield. A spacing of about 25 to 30 feet between adjacent trees or about 80 to 60 trees per acre is considered suitable for most places. If the seedlings are planted on the sides of channels or on bunds in single rows they may be spaced a little closer and the interspace may be 18 to 20 feet. In existing crowded coconut gardens it would be advisable to thin them out by cutting and removing the unproductive palms especially if the plantation is young.

INTER-CULTIVATION AND MANURING

No systematic manuring or inter-cultivation of coconut gardens is done at present in the State. There is a steady utilization of food material by the coconut tree and consequent depletion of plant foods from the soil. The average annual loss of the important plant foods from an acre of coconut garden yielding about 2000 nuts per year has been estimated to be about 18 lb. of nitrogen, 5 lb. of phosphoric acid and 38 lb. of potash. For maintaining coconut plantations in good condition and getting good yields from them, they have to be manured judiciously and regularly. In coconut, the effect of manuring or other agronomic practices on the yield of trees will be noticed only after about $2\frac{1}{2}$ to 3 years since this period is required for the development of the nuts from the primordial stage to full maturity. Manuring has, therefore, to be carried out regularly and systematically every year, to maintain the condition of the trees and obtain good yields. The application of potassic manures to supply 0.75 to 1.50 lb. of potash per tree per year, nitrogenous manures to supply 0.5 to 1.0 lb. of nitrogen per tree per year and phosphatic manures to supply $\frac{1}{2}$ lb. of phosphoric acid per tree per year is considered necessary for proper yielding. Twenty to forty pounds of ash or $1\frac{1}{2}$ to 2 lb. of potassium sulphate or muriate of potash would supply the above quantity of potash, 3 to 4 lb. of ammonium sulphate or 15 to 20 lb. of groundnut or other oilcakes, the above quantity of nitrogen and 2 lb. of bonemeal, the above quantity of phosphoric acid. Where the soils are deficient in organic matter, bulky organic manures like farmyard manure, compost and green leaves must be added to the soil. Growing a green manure crop like sannhemp or wild sannhemp (*Crotalaria striata*) and incorporating it into the soil is considered the best way of adding organic matter to the soil. Locally available manures may be used in quantities sufficient to yield the quantities of potash, nitrogen and phosphoric acid mentioned above.

Inter-cultivation in coconut gardens is of the greatest importance as it improves the yield of the trees to a remarkable extent. It has been demonstrated that by inter-cultivation alone, without any manuring, the yield could be raised by about 170 per cent. If the coconut growers in the State attend to these methods of cultivation, the yield would improve to a considerable extent.

PESTS, DISEASES AND THEIR CONTROL

Some of the palms in West Bengal are found to be attacked by the rhinoceros beetle and some by the bud rot and stem-bleeding diseases and no attempt is made to control them. To control the beetles, they must be extracted from the crowns of the palms by means of an iron rod with a hooked end. The breeding places of the beetles are manure heaps and heaps of decaying vegetable matter. The beetle grubs in these breeding places should be destroyed by spraying them with

benzene haxachloride at 0.01 per cent concentration.

Bud rot is a serious disease of the coconut. The first sign of the disease is withering of the central spindle of the youngest visible leaves in the crown. These leaves first turn light greyish brown, later becoming darker brown as the leaves bend over and finally break down at the base. The tender leaf base rots and emits a bad smell at times. The rot may spread outwards to the bases of some of the surrounding young leaves which turn yellow. Spreading inwards, the disease kills off the central bud, so that further growth of the palm is not possible. The infection may also start at the base of some of the older leaves as brown sunken spots and proceed inwards towards the central bud. Palms of all ages are liable to be attacked by this disease. The disease is spread by the driving winds during the monsoons, and possibly by insects also.

The following control measures are usually recommended. If the outer sheaths only are affected, these may be removed and the crown sprayed with one per cent Bordeaux mixture. If the disease is far advanced and there is no possibility of recovery, the entire crown should be cut down and burnt. As a prophylactic measure, the healthy trees surrounding the diseased one may be treated as follows: a mixture of copper sulphate, lime and common salt (1:3:5) enough to fill a cigarette tin, may be poured down the crown, or the trees may be sprayed with one per cent Bordeaux mixture.

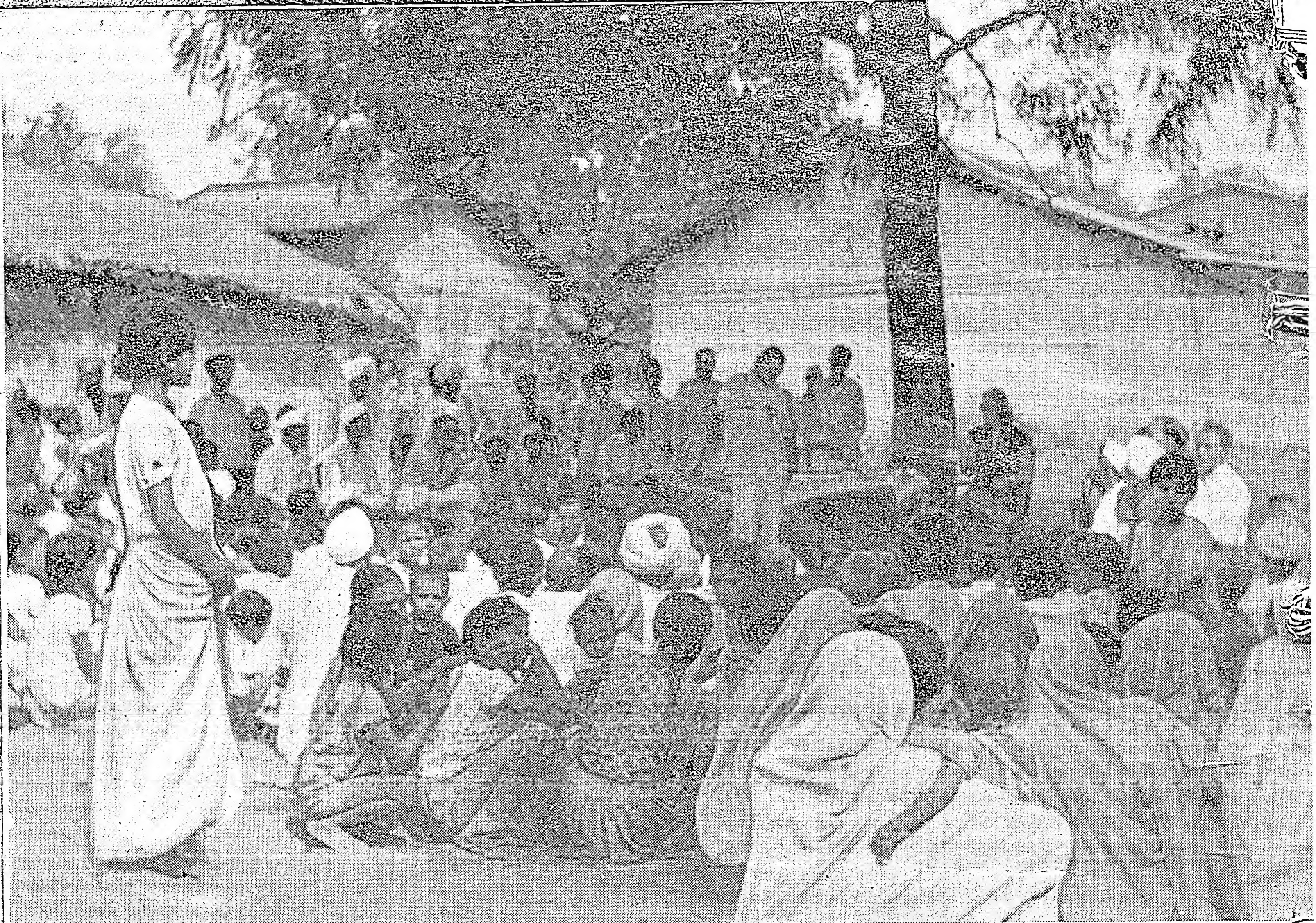
Stem bleeding is indicated by the reddish brown or rust-coloured liquid which oozes out of longitudinal cracks in the stem. The cracks vary in length from half to three or more inches. One or more patches of infection may coalesce to cover large areas. Old lesions cease to ooze and the dark brown fluid dries up and turns black. On cutting into the stem below the bleeding lesion the tissue will be found to be rotted and yellow in colour later turning into black. Infection may occur anywhere, but in the older palms it is usually in the lower parts of the trunk where cracks are abundantly developed and not in the softer portions of the trunk. The extent of damage depends on the age of the palm and the conditions under which it is grown. Young palms can be killed by the disease, but such cases are not common.

The disease can be controlled by carrying out the following treatment. The infected tissues should be cut out with a chisel. The inner tissue should be scooped out till no diseased tissue is left. The cut surface is painted over with coal tar or Bordeaux paste. The damage caused by the disease can be prevented if the palms are not subjected to any drastic changes in soil-moisture and optimum conditions for rapid growth are given.

UTILIZATION OF COCONUTS

In West Bengal, at present, the nuts are generally harvested in the immature stage for sale as tender nuts and few nuts are allowed to mature. Even in the case of tender nuts, scant attention is paid to the proper stage of development of the nuts for use as tender nuts giving sweet water. The nuts are harvested when they are too young and the water inside is, therefore, somewhat insipid. The preparation of copra and the extraction of coconut oil are generally not known to the people. The ripe nuts, copra, coconut oil etc., required by the people are to a large extent imported into the State from other areas.

The people of the State have to be educated about the use of coconut as a commercial crop and the full econommic utilization of its various products. It is hoped to bring this about through the five-year development scheme.

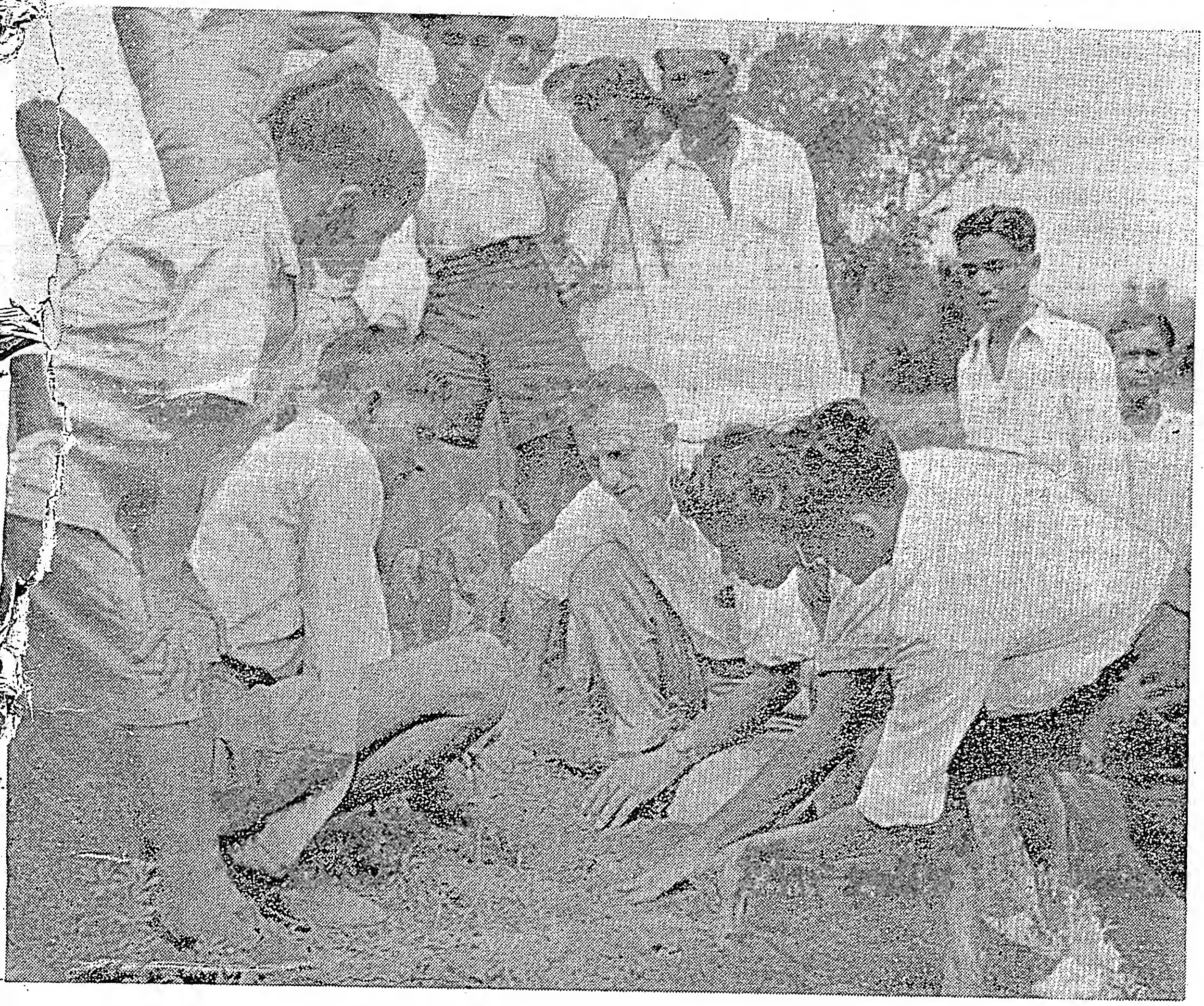


A discussion with farmers about their plans and difficulties. Women too are interested spectators

Village Development AT ANAND

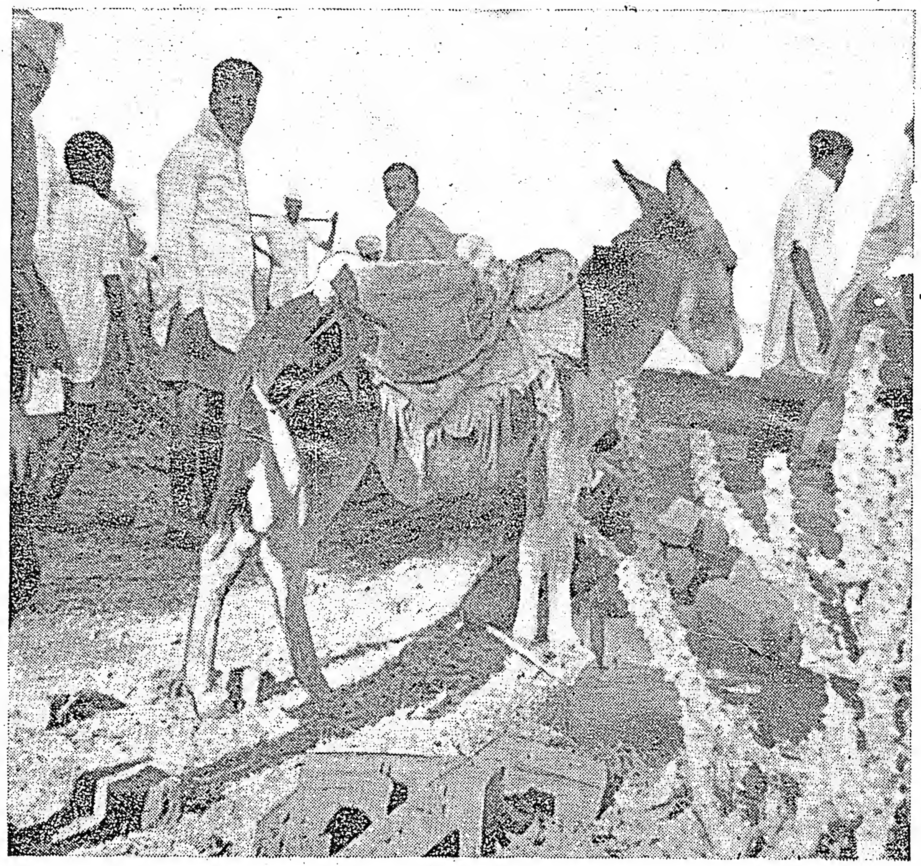
AGRICULTURE in India suffers from various inherent defects. These can in general be attributed to lack of finance, bad implements, poor livestock, insufficient manure, bad seeds, continuous cropping and fragmentation of holdings; as a consequence yields are low. In order to increase the yield these defects have to be remedied, but before any attempt is made to do so the farmer should be convinced of the harm done to him by these various shortcomings. It is only after he has been convinced that his active help and willing cooperation might be forthcoming to get rid of these.

One of the main objects of the training-cum-development centres is to help the farmer to appreciate these various factors which lead to poor yields and overcome them. This is a movement to help the farmers to help themselves. One such centre has been in operation at Anand in Bombay State. Pamol is a village where such educative efforts have been concentrated; it is situated about 10 miles from Anand.



A Tree-planting ceremony in Anand area village

Land-army road building project in the Anand Project Area



Land-army road building Project in the Anand Project Area

In this village one is able to find a small dispensary organized by the village people where ordinary drugs and medicines are available for the mere payment of an anna per person. There is also a small library which consists of 249 books. All these amenities were brought about by the Village Panchayat Mandal on the initiative of the first group of trainees at the training-cum-development centre at Anand.

The trainees consist of 15 agricultural officers of the Bombay State and 35 village level workers. These trainees work in 100 villages and attend to their developmental needs.

The emphasis in extension work is on demonstration and helping the villagers to help themselves by personal contact; books, pamphlets, leaflets and such other kinds of printed matter are of comparatively less importance in the work of this type. Farmers and the extension workers rather work as partners in a programme which aims to raise the standard of living and bring prosperity to the rural areas. In such a partnership the extension worker profits by the knowledge of the villager in agriculture and other matters as much as the villager himself from the knowledge of extension worker.

The programme consists of work undertaken both in the villages and at the headquarters at Anand. But it is mostly work in the villages where five days in a week the extension worker works. The work is almost of a sort of continuous activity of gathering and giving information and of discussing and solving the problems that present themselves. Certain days are set apart for special demonstrations. Demonstrations are

especially important as they carry conviction to the farmers of the utility of the new methods advocated.

For two days in a week the trainees remain at the headquarters at Anand to discuss the problems they have met with and the programme of work as a preparation for the assignment for the next five days. Whatever the problem is, it may relate to animal husbandry, agricultural production or irrigation or even medical aid, the trainees offer their help and try to find a solution.

In the villages the trainees live with and work among the farmers. They live the lives of a villager. This scheme of training-*cum*-development work is helped by two American experts Mr. Gordon R. Schlubatis and Mr. Millar J. Hatten. They are well pleased with the villagers and the trainees. (H.K.S.)

RUST-RESISTANT WHEAT VARIETIES FOR RAJASTHAN

By **M. P. BHATNAGAR,** Economic Botanist, Rajasthan

RUSTS play a great havoc with the wheat crop in Rajasthan as in other parts of India. They reduce the yield considerably. All the three rusts of wheat namely, black, yellow and brown are common in this State but the greatest damage is done by yellow and black rusts. Brown rust, however, causes very little damage. The cultivators ~~commonly call~~ these rusts as 'roti' which to them is a disease which colours leaves and stems orange yellow and diminishes yield.

To solve this rust problem and find a suitable rust-resistant variety for Rajasthan a trial was conducted at the Basi Farm (Jaipur). The varieties included along with the Rajasthan local wheat were N. P. 718, N.P. 715, N.P. 710, N.P. 758 and C. 591. The experiment was conducted for three consecutive years from 1946 to 1949. In the first two years both yellow and black rusts appeared in an epidemic form. The third year, 1948-49 was, however, a rust-free year.

Detailed studies on the infection of rusts on the wheat varieties under trial during the epidemic years showed that varieties N.P. 718, N.P. 710, N.P. 715 and N. P. 758 gave significantly higher yields while C. 591 and particularly the local variety gave very poor yields. For example, the variety N.P. 718 yielded 21 md. 7sr. and the local variety 8 md. 19 sr. in the epidemic year while in the rust-free year the yields were, respectively, 30 md. 20 sr. and 31 md. 10 sr. Thus the difference of yields in case of the local wheat is more than 100 per cent. During normal years, however, the yields of both C. 591 and local are slightly more than the rest of the varieties.

The farmers in Rajasthan can choose a variety like N.P. 718 or N.P. 710 till some other suitable rust-resistant variety is evolved. These varieties are less susceptible to rust as has been clearly proved by these experiments and in rust epidemic years, these could be their mainstay. These N.P. varieties were evolved by the Botany Division at the Indian Agricultural Research Institute, New Delhi.

KEY VILLAGE SCHEME IN ORISSA

By

U. PATNAIK, Livestock Officer, Orissa

WITH a view to improving the cattle wealth and thereby the agricultural economy of Orissa State, pedigreed Hariana and Red Sindhi bulls, have been stationed at different centres either on subsidy basis or maintained by the Utkal Go-Mangal Samiti for stud purposes. In addition, intensive cattle breeding work has also been in progress in certain areas like Bari, Angul, Salipur, Dhenkanal and Mayurbhanj with a view to gradually extending these activities to other areas of the State.

The programme of livestock development as envisaged under the Key Village Scheme introduced from April, 1952 has been carried out in accordance with its applicability to local conditions. A house to house survey has been conducted in the Key Village areas of Angul and Salipur for collecting the necessary data regarding livestock, their conditions, etc. The entire cattle population of both the centres has been vaccinated against contagious diseases. Scrub bulls have either been castrated or removed and all male calves over the age of one year or approaching one year have been castrated. Field veterinary dispensaries have been opened for the treatment of livestock in those areas. Propaganda regarding general management and proper feeding of cattle is being vigorously carried out and all possible technical help in these directions is being provided to livestock owners. At both the centres, artificial insemination of cattle by the staff specially trained for this purpose is being carried out and followed up with a view to multiplying the services of good bulls. Milk recording is also being done.

To encourage artificial insemination, a cattle progeny show was held at Salipur in October, 1952, where 234 calves born by artificial insemination were exhibited.